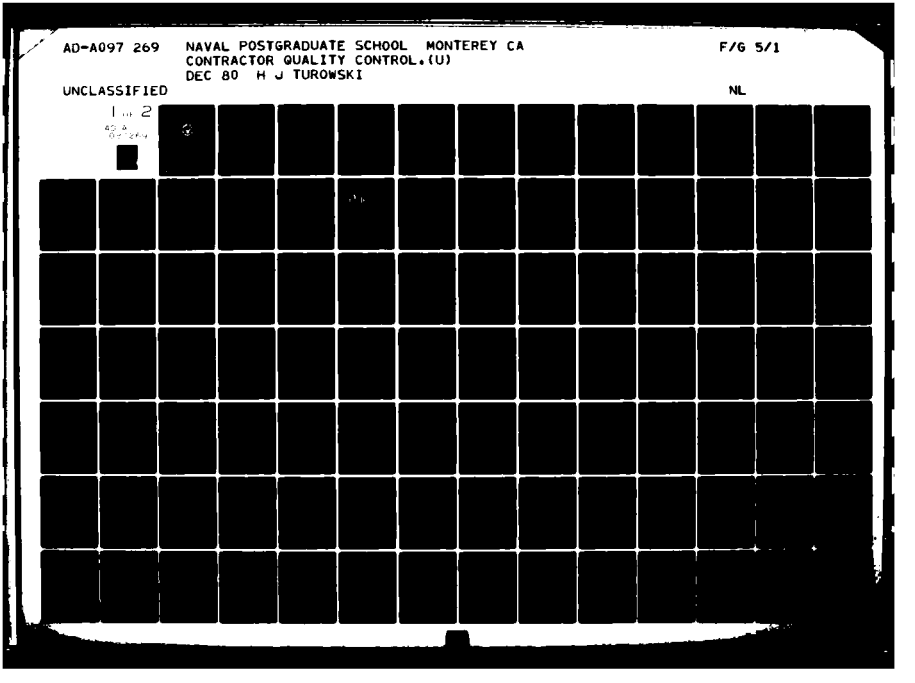
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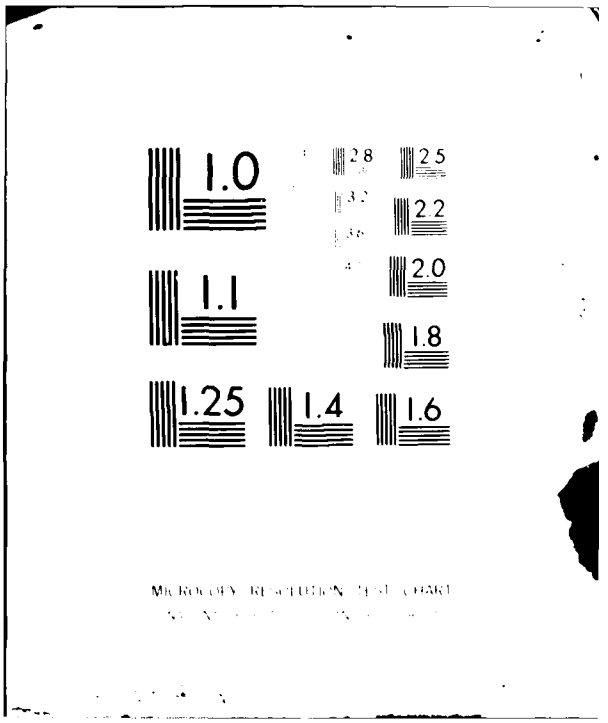
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

CONTRACTOR QUALITY CONTROL

by

Henry John Turowski Jr

December 1980

Thesis Advisor: R. Cunningham

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Contractor Quality Control (CQC) is a program whereby contractors awarded construction contracts in excess of $1 million are expected to assure the quality of their work using a formal system of inspection and documentation. The Navy instituted CQC in 1970.

Since its inception, CQC has been blamed for many of the problems that have arisen in the construction of Naval facilities,

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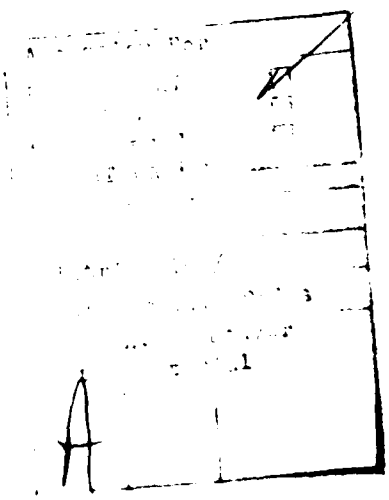
and a great many people charged with the administration of CQC have expressed dissatisfaction.

This thesis has researched the attitudes of those persons directly involved in the CQC process. A good deal of confusion and distrust was found to exist, and in many areas CQC has not lived up to its expectations or goals.

The overall conclusion, however, is that CQC is a necessary process, and that, if several minor changes are made, particularly in the education of CQC participants, CQC can become the tool needed by the Navy to effect quality construction in an environment of reduced inspection and administration manpower.



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CONTRACTOR QUALITY CONTROL

by

Henry John Turowski Jr.
Lieutenant Commander, CEC, United States Navy
B.S., United States Naval Academy, 1971

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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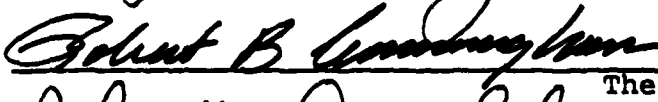
Approved by: 
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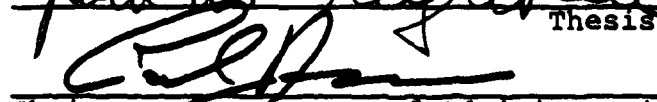
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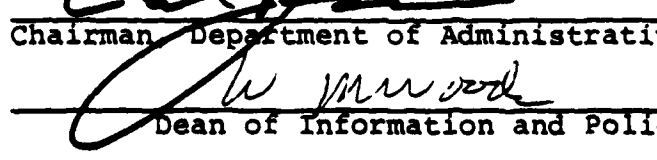
Dean of Information and Policy Sciences

ABSTRACT

Contractor Quality Control (CQC) is a program whereby contractors awarded construction contracts in excess of $1 million are expected to assure the quality of their work using a formal system of inspection and documentation. The Navy instituted CQC in 1970.

Since its inception, CQC has been blamed for many of the problems that have arisen in the construction of Naval facilities, and a great many people charged with the administration of CQC have expressed dissatisfaction.

This thesis has researched the attitudes of those persons directly involved in the CQC process. A good deal of confusion and distrust was found to exist, and in many areas CQC has not lived up to its expectations or goals.

The overall conclusion, however, is that CQC is a necessary process, and that, if several minor changes are made, particularly in the education of CQC participants, CQC can become the tool needed by the Navy to effect quality construction in an environment of reduced inspection and administration manpower.

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I. INTRODUCTION

Since 1970, all construction contracts executed by the Navy have included the provision that the contractor provide some form of Quality Assurance (QA) or Quality Control (QC). This requirement has evolved during the period since 1970 into the present Contractor Quality Control (CQC) program prescribed by Clause 76 of the General Provisions of all Navy construction contracts.

Quality assurance, the concept that a contractor should be responsible for the quality of his work, was developed by several writers in the post World War II era, and found a comfortable niche in the military environment.

The reason that QA was so enthusiastically adopted by the military is clear. During the period of the buildup and involvement of the United States in World War II, military construction output rose from .6% to 10% of all construction in the nation [Ref. 1]. The war's end provided a return to peace, but the need to maintain an adequate military posture in the post war era made it necessary for the country to support military development. The continued development of the Armed Forces would naturally require sustained construction of new facilities, and the rehabilitation of existing ones. Planned budget and personnel cuts, however, confronted the Services following the War, and an environment developed

where continued construction emphasis would have to be accomplished employing reduced administration funds and fewer inspection forces.

Enter QA, a concept whereby the contractor is expected to assure the customer that the quality of his finished product meets the specifications of the contract. In theory at least, QA should reduce the amount of administration and inspection required to assure an acceptable product. It is therefore easy to understand why the program found advocates in the military services. As budgeted contract administration and inspection dollars were reduced, the need for some sort of positive counter-action correspondingly increased, and in gradual measures a formal program of quality assurance was developed. This program has, since the time of its inception, been modified and expanded into its present form as Contractor Quality Control.

CQC, however, has not been the expected panacea. A basic distrust by military personnel of the contractor as a self-inspector, coupled with abuses of the system by both the military and the contractors, has led in many cases, not to the intended program of mutual cooperation toward quality construction, but rather toward skepticism and outright hostility.

Soon after the Navy's initiation of its CQC program, a Navy Civil Engineer Corps officer, then LTJG Clay Dean, sensing the potential problems CQC would bring, investigated the effect of CQC on interested personnel. His results were

published as a postgraduate Master's Degree thesis at the University of Colorado in 1974.

In the years since these findings were revealed, the problems uncovered in the CQC program have not disappeared, and in some cases, may have increased in intensity. The purpose of this thesis is to examine the present opinions and attitudes of personnel toward CQC, to compare those opinions within the Naval Facilities Engineering Command (NAVFAC), and to ascertain the costs of continued incorporation of CQC into contract construction.

The primary method of investigation employed in this thesis was an opinion survey circulated to the five Engineering Field Divisions (EFD's) located in the continental United States. These were the Chesapeake Division (CHESDIV) in Washington, D.C., the Northern Division (NORTHDIV) in Philadelphia, PA, the Atlantic Division (LANTDIV) in Norfolk, VA, The Southern Division (SOUTHDIV) in Charleston, S.C., and the Western Division (WESTDIV) in San Bruno, CA. Questionnaires were also sent to twenty-three (23) construction field offices across the country, to fifty-one (51) contractors familiar with the CQC program, and to the CQC coordinator in NAVFAC.

II. CONTRACTOR QUALITY CONTROL

A. THE CONSTRUCTION INDUSTRY

That a contractor should in some measure be responsible for the quality of his work is a principle that has almost universally been adopted by the construction industry since the end of World War II. However, the definition of quality as applied to the construction industry, and the means by which to evaluate it, have been illusive.

The dictionary defines "quality" as a distinguishing characteristic, or a degree of excellence. For the purposes of this paper, construction quality could be understood to mean that construction which, when accomplished, is based on the best possible design and specifications, the most effective use of owner and construction material and equipment resources, and the most competent and efficient craftsmanship.

The adaptation of quality controls to construction has been somewhat recent, having been originally applied only to the manufacturing and supply processes. In recent years, however, top management personnel of Architect and Engineering (A&E) and construction contracting firms have also realized the vital role of quality control in their operations [Ref. 2].

The reasons for this new awareness are many. John B. Guernsey, a member of several committees of the American Society of Testing and Materials (ASTM) indicated that

increased consumerism is a major factor. By focusing attention on quality, consumers have made manufacturers conscious of the reliability and durability of their goods. The ultimate results from this focus on quality are benefits both to the consumer in better quality goods, and to the manufacturer in increased public prestige and product reputation [Refs. 3, 4]. Ross F. Miller, Senior Vice President of Northrup Corporation, echoes this belief when he explained that in the marketplace price is rapidly being replaced by value as the ultimate determinant of sales [Ref. 5].

In addition to the consumer issue, the courts have also recently been more demanding in their philosophy toward the legal liability of manufacturers, designers, and contractors as witnessed by a dramatic increase in suits, claims, and fines against them [Ref. 2]. Couple these consumer and legal pressures with both the increasing demand of the Government and other major users of goods for the contractor to take an active role in the quality picture, and the fact that foreign competition is outselling U.S. firms in increasing numbers of areas, and the result is enormous pressure on the contractor to institute and enforce a workable program of quality control.

Not all the forces are external, however, since the very nature of some industries, particularly in construction, exerts a powerful push for change. There are no easy profits to be made in construction unless the contractor is totally prepared to meet all the contingencies, and has an organization

flexible enough to do so. Productivity in the construction industry rises at an annual rate of less than 1%, far less than in many others, yet at the same time the costs of wages and materials are rising alarmingly. Recent data indicate that low productivity wastes from 14% to 40% of every construction dollar spent. In this environment, a contractor simply cannot afford to be inefficient, and any program that provides the contractor with better control of his operations cannot help but improve his chances to succeed [Ref. 6].

In the private sector, where quality assurance is encouraged rather than required, the process by which a contractor provides this service is not clear. Professor Glen E. Hayes, Professor of Industrial Technology at California State University, proposed that firms revise their basic goals and objectives to include specific corporate policy statements establishing quality assurance as an essential element of the firm's objectives. He stated:

> If policy statements adequately reflect Quality objectives, and if the information prescribed in policy statements is correctly articulated into the design, operating procedures, specifications and methods, and if output is congruent with these procedures and specifications, the number of significant Quality problems is reduced. [1]

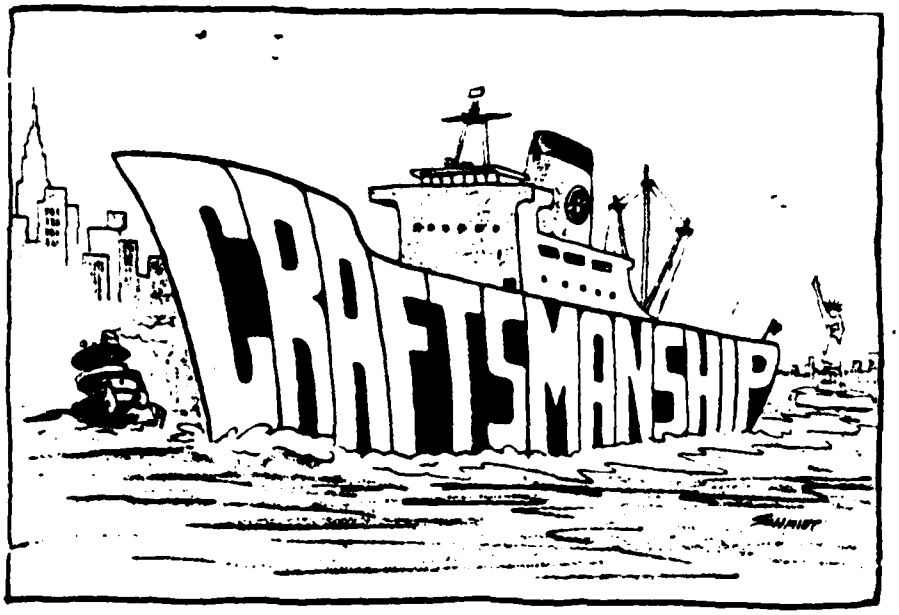
Other authors suggest a not-so-intensive practice whereby the quality aspects of each product or contract are individually determined. This process, sometimes called "Quality Evaluation," generates the quality requirements for the intended finished product. Quality is examined as related

to each individual attribute of the product and the importance of each attribute is defined. A decision is then made as to the best quality level for each attribute. The ultimate objective of quality evaluation is the determination of the best quality level for the finished product, one that balances the customer's needs and expectations with price and cost [Ref. 7].

One alternative might be for organizations in the United States to move in the direction of Japanese enterprise and produce quality products by encouraging the development of the human side of the organization and the firm as a medium for employees to express creativity, achieve self-fulfillment, attain recognition, and interact socially. This technique, the "QC Circle," has helped lift Japan to its present status as a major economic power [Ref. 7].

Whatever direction the firm or industry decides to take, the importance of quality controls cannot be overemphasized, and if the United States is to remain competitive in the marketplace, momentum must shift away from corporate and worker apathy toward an atmosphere of cooperation and quality craftsmanship. As Mr. Miller put it:

> Inferior quality is not, or need not be, a characteristic of American-made products or services. High-level management throughout American industry must appreciate the importance of quality control as an integral part of the design, engineering, and production process, a critical element in the manufacturing system that reflects a firm's commitment to excellence and its thorough understanding of the relationship of quality to profit.[2]



"Craftsmanship, that cherished term rooted in our history, is now associated more often with our overseas competition."

[Ref. 5]

B. THE MILITARY ENVIRONMENT

The Armed Forces of the United States recognized early-on the importance of quality assurance in the procurement process, and in 1947 adopted the Armed Services Procurement Act which defined the methods by which military contracting could be accomplished. In 1954 the Department of Defense (DOD), by instruction 4155.6, asserted that contractors must be more responsible for quality [Ref. 8]. The firmness of DOD's commitment to quality assurance was demonstrated in 1956 when the Procurement Act was incorporated into Title 10, Chapter 137 of the United States Code, thereby becoming law.

As further refinements to the military procurement process, DOD, in 1957 and 1959, issued instructions 4155.8 and 4155.10 respectively as a means by which to govern the relationship between the contractor and the Government in procurement of both complex equipment and systems and also the routine supply items defined in military and federal specifications. These instructions set forth the contractor's responsibilities as including the basic regulation of quality through a "quality program," and also the means and extent of testing to be performed in support of quality. The Government was therein afforded responsibility for verifying the effectiveness of the contractor's quality program and methods [Ref. 8]. In 1961, the essence of these instructions became law when the Armed Services Procurement Regulations (ASPR) adopted clause 7-602.10 requiring the contractor to maintain an inspection system adequate to ensure that the work performed conforms to all contract requirements and to make available to the Government records of all inspections made in this regard [Ref. 9].

In 1966, the Army Corps of Engineers was the first of the Armed Services to adopt a formal program of Contractor Quality Control (CQC). The Corps defined CQC as: "The systematic application of the methods, inspection techniques, and testing procedures required to assure that all of the materials, equipment and workmanship conform to the contract requirements."[3]

While the Corps was in the process of reviewing and revising its CQC program, the Navy, through NAVFAC, was closely observing the Corps' results. The Navy had previously been tightly controlling the contractor in his actions rather than encouraging his ingenuity and expertise. The thrust of Navy contract administration was toward protecting the Navy from contractor errors rather than providing the Navy with the best overall finished product [Ref. 10].

In March 1970, the Navy instituted its own CQC program. Bob Robertory of NAVFAC' Chief Counsel's Office defined CQC then and now as a system by which to make the contractor more responsible for the quality of his own work. [Ref. 11]. The COC Manual, published to set in writing the requirements of the Navy's CQC program, lists some of the benefits of CQC as better use of Government and contractor personnel, fewer claims, contract cost savings, and fewer construction conflicts. The contractor is expected to achieve these benefits through the use of better management techniques, more efficient scheduling of manpower and material usage, and greater overall control of the construction process.

One further event which helped motivate the Navy toward full implementation of CQC was an audit in 1971 performed by the Comptroller General of the United States. This audit investigated the effectiveness of the Navy's and Army's construction programs by comparing finished construction with the original specifications. The report states that:

> A number of military facilities accepted by the Government as completed were not built in compliance with contract requirements. As a result, the facilities were not fully satisfactory for their intended purpose and/or the Government had to spend additional time and effort having deficiencies corrected. [4]

The report recommended the improved enforcement of CQC, better reports from Government inspectors, better training for Government inspectors, inspections and evaluations of field activities by Headquarters, and coordination of similar Army and Navy construction problems toward common solutions.

In 1974, NAVFAC revised and reissued the CQC manual to include productive suggestions and inputs from field divisions and field offices based on their experience with CQC construction. The revised manual defined the requirements of CQC, provided the scope of action of both the contractor and Government with regard to reports, submittals, the CQC paln, defective materials and workmanship, work stoppages, incompetent CQC representatives, and the appraisal of contractor performance [Ref. 11].

In 1978, the Armed Services renamed the ASPR the Defense Acquisition Regulations (DAR) and retained the provisions for CQC.

The first in-depth evaluation of the progress and effectiveness of CQC as a means of Naval construction contract execution was accomplished in 1974. Joseph Clay Dean, a Navy Civil Engineer Corps (CEC) officer and a postgraduate student at the University of Colorado, wrote an extensive and interesting thesis on the attitudes of personnel toward the

CQC program. His research revealed definite trends in the attitudes of the various parties involved in the administration of CQC [Ref. 10].

The Navy has had an additional six years since 1974 to adapt to and practice CQC. It appears that CQC remains the controversial and misunderstood program that was revealed in the 1974 study, and little has been accomplished to sell the program to Navy or contractor personnel. NAVFAC is presently in the process of revising the CQC manual for the purpose of clearing up any philosophical issues and refining the definition of key terms [Ref. 12]. According to NAVFAC's Chief Counsel's Office, the CQC program is a viable one expected to continue in the foreseeable future [Ref. 11].

The essence of present day CQC policy, as set forth in Clause 76 of the General Provisions of all appropriate construction contracts, is as follows:

1. The contractor will provide a quality control organization to perform all necessary inspections and tests on all aspects of the contract.

2. The contractor will provide an independent quality control representative on the work site at all times during progress, with full authority to act to ensure compliance.

3. The contractor will submit a CQC plan to the Government which includes the letter appointing the CQC representative and outlining his authority, defining the CQC organization to be used, relating the qualifications and authority of all

persons involved in the CQC process, listing testing and other organizations to be employed, defining submittal procedures, including an inspection schedule, and detailing the procedures of the CQC organization.

4. The contractor will provide all preparatory, initial, and follow-up inspections as required.

5. The contractor will meet with the contracting officer prior to the beginning of construction to discuss CQC.

6. The contractor will submit daily CQC reports in a format approved by the Government.

7. The contractor will submit all test results and validate all submittals prior to submission.

III. DATA COLLECTION AND COLLATION

A. THE SURVEY

Appendix A contains a copy of the survey questionnaire prepared in conjunction with this research. The intent of the questionnaire was to question the attitudes of Navy contracting personnel and to compare them with those of contractors who have had CQC experience. In order to evaluate the changes that have occurred in the attitudes of those persons dealing in the administration of CQC, many of the questions included in the questionnaire were necessarily similar to those of the Dean survey of 1974. In an effort to attract the greatest number of responses, the format and wording of Appendix A were designed to be both simple and easy to understand. The same survey form was used to collect the data from the Government workers and contractors.

The questionnaire was divided into three sections. The objective of the first was to determine the position and CQC experience of the respondent, the second to investigate the attitudes of each respondent on various aspects of CQC, and the third to obtain the views of the respondent regarding the cost effectiveness of the CQC program in its present form. Where non-CQC construction is referenced, it was intended to denote any construction performed without the surveillance of a contractor's CQC representative.

Survey forms were forwarded to the Construction Divisions of each stateside EFD and to a combination of twenty-three (23) large and small contract field offices. The coordinator of NAVFAC's CQC program was interviewed by phone and his responses were also included. Each EFD provided a list of responsible contractors, having had previous CQC experience, who were also asked to respond. A stratified survey was thus designed for a population limited to persons within the NAVFAC contract organization.

Response to the questionnaire is shown in Table I. Total Navy-wide response, at sixty-six percent (66%), was well in excess of the thirty percent (30%) predicted by statistics sources. Response by EFD varied from a high of ninety-seven percent (97%) (LANTDIV) to a low of thirty-four percent (34%) (CHESDIV). Contractor response, at thirty-five percent (35%), followed predictions. It should be noted that the response rate was calculated by comparing the number of questionnaires returned with the number sent. Since the size of most office staffs was not known, the number of responses sent was in some cases greater than the number of personnel available to answer. The true response was therefore somewhat larger than calculated.

The Dean survey was based on fifty-four (54) Navy and forty-two (42) contractor responses. One hundred sixty (160) Navy and thirty-six (36) contractor responses have been analyzed in this research.

TABLE I

SURVEY QUESTIONNAIRE RESPONSE

Questionnaire Recipients	Number Sent	Number Received	Percent Returned
NAVFAC	1	1	100
CHESDIV Navy	32	11	34
CHESDIV Contractors	18	5	28
NORTHDIV Navy	50	32	64
NORTHDIV Contractors	20	7	35
LANTDIV Navy	46	45	97
LANTDIV Contractors	20	6	30
SOUTHDIV Navy	46	34	79
SOUTHDIV Contractors	20	5	25
WESTDIV Navy	67	37	55
WESTDIV Contractors	24	13	54
Total Navy	242	160	66
Total Contractors	102	36	35
Grand Total	344	196	57

B. QUESTIONNAIRE RESPONSE

Response to each question and statement is discussed in this section. Raw responses were collected and tabulated according to the EFD from which they were received. Individual field office response is not shown since this would violate the confidentiality of the survey. The response tables provided with each answer analysis also include the percentage of response to each portion of the answer. In order to attach greater significance to the answers of those persons having the most experience with CQC, raw responses were also weighted using the process shown in Appendix B. In order to test the validity of the weighting system selected, sensitivity analyses, as detailed in Appendix B, were also performed. Weighted results were used to calculate the revised response percentages displayed in the figures accompanying the response tables, and also to identify the individual within each EFD receiving the highest weighted experience score. Within each EFD's response, the answer of the highest scoring individual is highlighted by an asterisk (*). Navy and contractor weighted responses are indicated by an "N" or "C" in the vertical bars of each figure.

Analysis of the survey results was accomplished by observing and plotting the answers to each question, by then comparing them between Government and contractor respondents, by examining EFD response, and by examining the response of the high scorers. It should be noted that the number of responses

received for each question or statement did not always match the number of respondents since some of the questions were answered more than once, and answers to other questions were omitted.

The interpretations of the data provided by the survey are solely the author's. Data analysis is at best an inexact science, and other, equally valid, conclusions are possible. Those conclusions included as a part of this research were based in part on the write-in comments of respondents, in part on a review of available literature, and in part on the nature of the response received.

1. Section A, Question 1 - What is your present job title?

Table I shows the overall response to the survey questionnaire. The distribution of respondents is shown below in Table II.

TABLE II

BREAKDOWN OF TOTAL RESPONSE BY JOB TITLE

Category	CHESDIV Number Resp.	NORTHDIV Number Resp.	LANTDIV Number Resp.	SOUTHDIV Number Resp.	WESTDIV Number Resp.	TOTAL Number Resp.	%	Dean Survey Number Resp.
ROICC	0	0	2	6	4	12	8	11
AROICC	6	2	12	7	8	35	22	21
Construction Representative	0	17	25	7	11	60	38	11
EFD Area Coordinator	5	5	3	6	3	22	14	7
Contract Specialist	1	0	1	1	2	5	3	0
Other	0	8	2	7	9	26	16	4
Total Navy	12	32	45	34	37	160		54
CQC Representative	3	3	3	1	5	15	42	11
CQC Contractor	2	4	3	4	8	21	58	31
Total Contractor	5	7	6	5	13	36		42

There are several differences between this and the previous Dean research. First, the size of the responding Navy population, at one hundred sixty (160) persons, is three times as large; second, a much greater percentage of construction representatives and contract specialists responded; and

finally, the contractor portion, although approximately equal in size, contains an almost equal percentage of CQC field office and home office representatives. The responses provided and analyzed herein should therefore represent a much broader overall view of CQC.

2. Section A, Question 2 - What is your rank (military/ civilian) or company position?

Table III provides the distribution of Navy personnel by rank. No such breakdown was practical for the contractor respondents since titles and positions vary according to company structure. The "unknown" row indicates respondents who answered the questionnaire but did not provide their rank or GS rating.

The major difference between this survey and the previous one in the ranking structure of the respondents was found in the greater percentage of responses from field office civilians. Civil Service input from Resident Officer in Charge of Construction (ROICC) offices provided greater than 70% of the civilian input. The military response was approximately the same in both number and rank to the Dean survey, and came totally from officers with present or recent Officer in Charge of Construction (OICC) experience.

TABLE III

BREAKDOWN OF TOTAL RESPONSE BY RESPONDENT RANK

Category	Military No. Responses	Military % of Total	Dean Survey No. Responses
O-6	1	3	1
O-5	4	12	3
O-4	8	24	10
O-3	15	44	7
O-2	4	12	6
O-1	2	6	4
Total	34		31
Civil Service			
GS 15	2	2	
GS 14	2	2	3
GS 13	7	6	
GS 12	38	30	8
GS 11	26	21	3
GS 9	30	24	5
GS 8	6	5	0
GS 7	4	3	0
GS 4	1	1	0
Unknown	10	8	4
Total	126		23
Grand Total	160		54

3. Section A, Questions 3 and 4 - How many CQC contracts have you inspected, administered, or been awarded in the past five years in the following ranges? How many non-CQC contracts have you inspected, administered, or been awarded in the past five years in the following ranges?

These two questions provided the basis for the calculation of the weight given to each respondent's answers. Appendix B explains the weighting system employed in this research. Listing the answers given to these questions was therefore not necessary.

4. Section B, Question 1 - In general, who should be responsible for the inspection of contract construction for compliance with plans and specifications?

The response to question B1 is contained in Table IV. In every case the majority of EFD respondents felt that the Navy should be responsible for inspection to determine compliance with plans and specifications. Reinforcing this position was the fact that the highest scorer in every EFD also preferred Navy responsibility, and that the majority of contractors (51%) also agreed. Further, weighting of responses, as illustrated in Figure 1, increased the percentage of both Navy and contractor preference from sixty-four percent (64%) to sixty-seven percent (67%) and fifty-one percent (51%) to fifty-three percent (53%), respectively.

Previous research indicated a preference for shared Navy-contractor responsibility [Ref. 10], however, no percentages were available to indicate the degree of preference.

In the CQC process the on-going role of Navy inspection is often minimized or forgotten. In the view of NAVFAC, many Navy personnel see CQC as an opportunity to slacken contract surveillance while the contractor carries the burden of construction compliance [Ref. 11]. The key to good inspection, as suggested by the Army Corps of Engineers (COE) and advocated by NAVFAC is thorough familiarity with all the provisions of the contract, including plans, specifications,

changes, and administrative policy [Ref. 13]. The apparent shift in sentiment from shared to sole Navy responsibility may indicate an awareness on the part of all personnel of the need for greater involvement on the lowest levels of construction management.

Considering the response in total, it is interesting to note that twenty-four percent (24%) of the Navy respondents prefer the contractor to accept compliance inspection responsibility and eleven percent (11%) prefer the project designer (A&E). Contractors, on the other hand, adopted the more cosmopolitan view that the A&E should have a greater stake in the process - thirty-four percent (34%) - and only thirteen percent (13%) saw this primarily as the contractor's role. The position of the designer in the CQC process has caused confusion and elicited much response throughout this survey.

TABLE IV

RESPONSE TO QUESTION B1 - Responsibility for plans and specifications compliance inspection.

NAVY PESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1*	50	0	0	1*	50	0	0	2	1
CHESDIV	9*	69	0	0	4	31	0	0	13	6
NORTHDIV	23*	49	9	19	14	30	1	2	47	23
LANTDIV	41*	73	5	9	9	16	1	2	56	27
SOUTHDIV	32*	76	4	10	6	14	0	0	42	20
WESTDIV	25*	56	5	11	15	33	0	0	45	22
TOTAL	131	64	23	11	49	24	2	1	205	

CONTRACTOR RESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	1	20	0	0	0	0	5	11
NORTHDIV	4	33	5	42	3	25	0	0	12	27
LANTDIV	2	25	4	50	2	25	0	0	8	18
SOUTHDIV	3	43	3	43	0	0	1	14	7	16
WESTDIV	10	77	2	15	1	8	0	0	13	29
TOTAL	23	51	15	34	6	13	1	2	45	

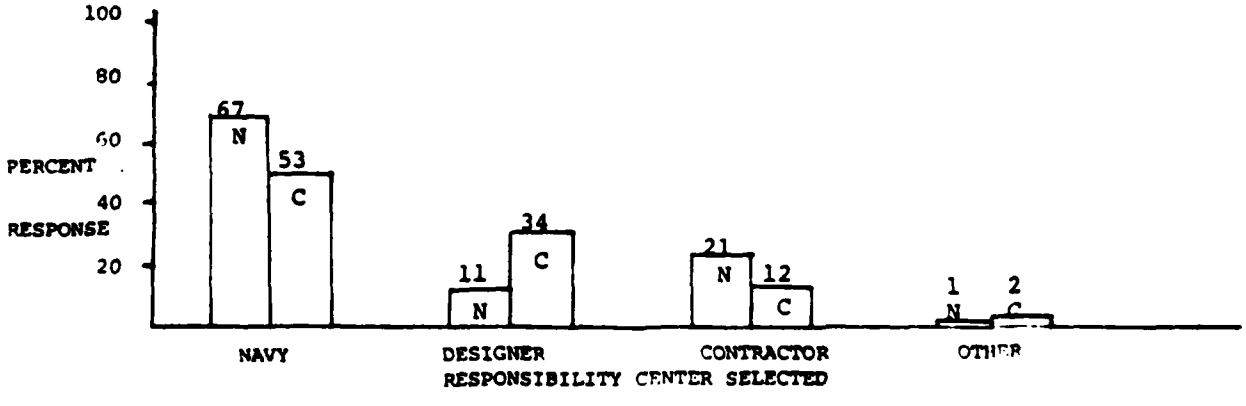


Figure 1. Weighted response to Question B1.

5. Section B, Question 2 - In general, who should be responsible for the progress inspection of contract construction?

Table V and Figure 2 display responses to question B2. In every case, the majority of respondents and the highest EFD scorer felt that the Navy should have primary responsibility for progress inspection. Weighting increased this preference from seventy-six percent (76%) to seventy-nine percent (79%) for Navy respondents and from sixty percent (60%) to sixty-three percent (63%) for contractors. Previous research indicated the preference for shared inspection [Ref. 10].

A natural question that could be asked in regard to the CQC program would be that, if the contractor is to be responsible for the quality of his work, why inspect him at all? Inspection of the contractor's inspection program is very necessary however. In the construction process, where the delivery of a finished contract can take a long period of time, it would be foolish not to take advantage of the opportunity for construction surveillance [Ref. 14]. The broad-base support for Navy inspection of contract progress, as demonstrated by the response to this question, reflected the belief that the participants of the CQC program also preferred that the Navy take advantage of this inspection opportunity.

If the second and third choices of the respondents were examined, an interesting development again occurred.

The contractor again designated the role of the designer in progress inspection as important (20%), while Navy respondents, on the other hand, considered it a minimum one (6%). Navy respondents chose the contractor (17%) as the second most likely agent for progress inspection.

TABLE V

RESPONSE TO QUESTION B2 - Responsibility for progress inspection.

NAVY RESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		1	1
CHESDIV	11	92	0	0	1	8	0	0	12	6
NORTHDIV	29	71	4	10	8	20	0	0	41	22
LANTDIV	41	82	0	0	9	18	0	0	50	27
SOUTHDIV	31	84	1	3	5	14	0	0	37	20
WESTDIV	29	64	6	13	9	20	1	2	45	24
TOTAL	142	76	11	6	32	17	1	1	186	

CONTRACTOR RESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	1	20	0	0	0	0	5	13
NORTHDIV	4	40	3	30	3	30	0	0	10	40
LANTDIV	4	67	0	0	2	33	0	0	6	15
SOUTHDIV	2	33	3	50	1	27	0	0	6	15
WESTDIV	10	77	1	8	2	15	0	0	13	33
TOTAL	24	60	8	20	8	20	0	0	40	

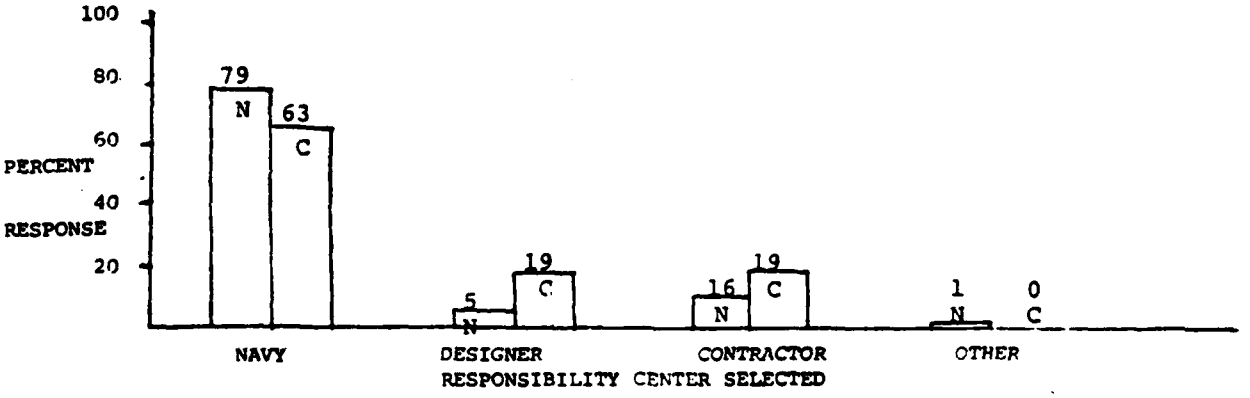


Figure 2. Weighted response to Question B2.

6. Section B, Question 3 - In general, who should be responsible for the final (acceptance) inspection of contract construction?

To an even greater extent than in the previous two questions of Section B, the response received indicated the strong belief that the Navy should be responsible for final inspections. Table VI and Figure 3 apply. This particular question was answered identically by more respondents than any other question or statement in the survey questionnaire. There are probably two reasons for this overwhelming response: one legal, the other psychological.

First, there is the rule of "caveat emptor" (let the buyer beware) which has a firm basis in law, and which therefore prompts the Navy to have a last hard look at the work presented for acceptance [Ref. 14]. Second, once the facility has been completed, every individual involved in the construction process, from the designer to the inspector, has a personal stake in its quality. No one wishes to be called onto the carpet after a contract has been accepted, to discuss preventable construction errors, or to be personally connected with a contract that provides only marginal fulfillment of the customer's needs. The final inspection becomes, theoretically at least, the last chance for many parties to satisfy themselves that the quality of the finished product is acceptable.

Weighting of the response increased the preference for Navy responsibility from eighty percent (80%) to eighty-one percent (81%) for Navy respondents, and from seventy-one percent (71%) to seventy-five percent (75%) for contractors.

It is in the aspect of final inspection that the Navy and contractors agree on the relative importance of the designer's and contractor's roles. Eleven percent (11%) of the Navy respondents, and twenty-one percent (21%) of the contractors preferred the designer as the second choice. This may reflect the fact that, while there is no established niche for the designer to occupy in the construction portion of the CQC process, the designer has traditionally been a party in the final inspection.

TABLE VI
RESPONSIBILITY FOR FINAL
RESPONSE TO QUESTION B3 INSPECTION

NAVY RESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		1	1
CHESDIV	11	100	0	0	0	0	0	0	11	6
NORTHDIV	31	66	9	19	7	15	0	0	47	24
LANTDIV	46	87	5	9	2	4	0	0	53	27
SOUTHDIV	34	94	0	0	1	3	1	3	36	18
WESTDIV	35	70	8	16	4	8	3	6	50	25
TOTAL	158	80	22	11	14	7	4	2	198	

CONTRACTOR RESPONSE

	RESPONSIBILITY CENTER SELECTED									
	NAVY		DESIGNER		CONTRACTOR		OTHER		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	5	100	0	0	0	0	0	0	5	12
NORTHDIV	5	45	4	36	2	18	0	0	11	26
LANTDIV	6	100	0	0	0	0	0	0	6	14
SOUTHDIV	3	50	3	50	0	0	0	0	6	14
WESTDIV	11	79	2	14	0	0	1	7	14	33
TOTAL	30	71	9	21	2	5	1	2	42	

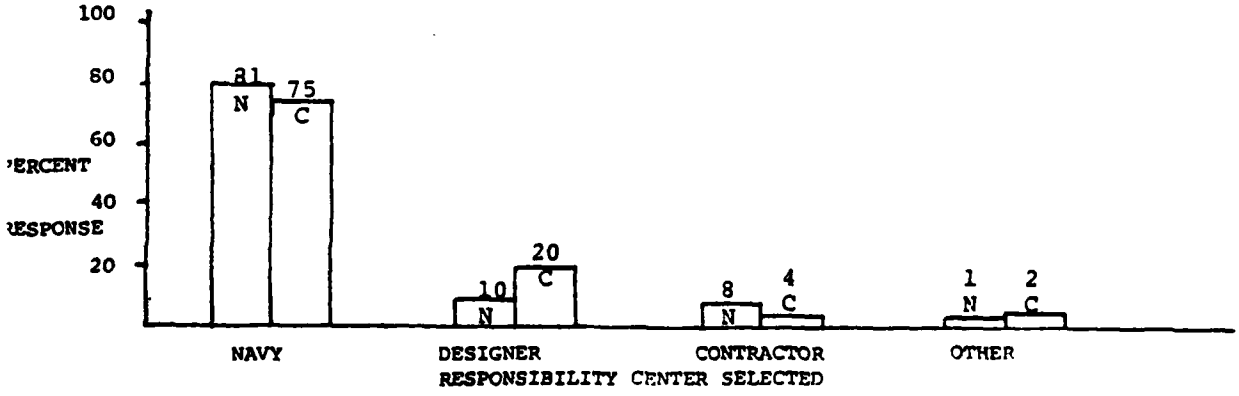


Figure 3. Response to Question B3.

7. Section B, Statement 4a - The contractor should be responsible for the quality of his work, and would provide adequate self-inspection without the CQC contract provision.

The majority of all EFD respondents (55%) and all highest scorers except one (SOUTHDIV) disagreed with this statement, demonstrating the belief that, without CQC, the contractor would not adequately inspect his own work. The majority of contractors (63%) held the opposite view.

Several respondents noted that this statement seemed in reality to relate to two issues, the first to whether the contractor should be responsible for quality, the second to his self-inspection without CQC. At the time of the initiation of the survey questionnaire, the first point seemed undebatable, indeed the current literature propounded almost universally, that the contractor was responsible for the quality of his work. Further, previous research demonstrated a very strong tendency for both Navy (91%) and contractor personnel (88%) to agree with this premise [Ref. 10]. The thrust of this statement was therefore directed at whether the contractor would adequately inspect himself if not required to do so. Table VII and Figure 4 illustrate the response.

Weighting increased the percentage of both Navy and contractor respondents disagreeing to fifty-six percent (56%) and twenty-four percent (24%), respectively. It would seem that Navy personnel were suspicious of the contractor's ability to adequately inspect himself, while contractors, on the other hand, felt confident of their self-inspection capabilities.

TABLE VII

RESPONSE TO STATEMENT B4a EQUAL CONTRACTOR SELF-INSPECTION WITHOUT THE CQC PROVISION

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	4	44	2	22	0	0	1	11	2	22	9	6
NORTHDIV	16	52	4	13	0	0	7	23	4	13	31	19
LANTDIV	15	33	11	24	1	2	6	13	13	28	46	28
SOUTHDIV	15	44	1	3	0	0	4	12	14	41	34	21
WESTDIV	15	36	6	14	2	5	10	24	9	21	42	26
TOTAL	66	40	24	15	3	2	28	17	42	26	163	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	2	40	0	0	1	20	1	20	1	20	5	14
NORTHDIV	2	29	1	14	0	0	1	14	3	43	7	16
LANTDIV	0	0	0	0	1	27	3	50	2	33	6	14
SOUTHDIV	1	20	0	0	0	0	2	40	2	40	5	13
WESTDIV	0	0	5	42	0	0	3	25	4	33	12	27
TOTAL	5	14	6	17	2	6	10	29	12	34	35	

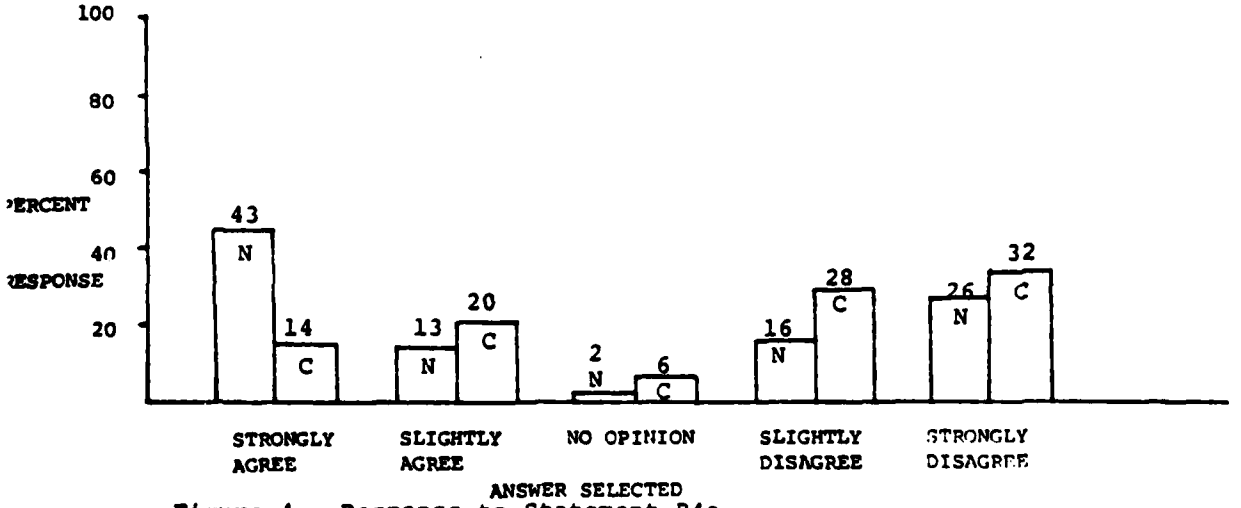


Figure 4. Response to Statement B4a.

8. Section B, Statement 4b - CQC usually provides the means for a smooth interface between the contractor and the Navy.

Table VIII and Figure 5 show the reply to this statement. In general, response was mixed with Navy respondents, EFD's, and high scorers split evenly between agreement and disagreement. However, since only eight percent (8%) of all Navy respondents (including the NAVFAC high scorer) strongly agree with the statement, it can be safely stated that the overall opinion of CQC as a medium to develop a smooth Navy-contractor relationship is not strong. This premise is supported when contractor opinions are also examined, since a strong majority of contractors (74%) do not feel CQC provides a smooth interface. Whether the dissatisfaction evidenced is related to CQC in general, or only to the Navy's CQC program, cannot be determined from this survey. It should be noted, however, that CQC as presently practiced can be considered inadequate in this regard since, by not producing a smooth interface, it apparently cannot meet its goal of reducing conflicts.

This problem is not one that is unsolvable, however. Many general comments from both Navy and contractor personnel indicated that the CQC concept is a good one. As one company president put it, "The CQC program is an effective way for a public owner to buy an extra measure of supervision from

a contractor. The extra degree of supervision can have a great effect in assuring a quality end product for the owner." It is in the application of CQC to the construction process where problems were most often noted.

The task confronting the Navy, therefore, is to improve the CQC program in those areas that will allow the most efficient use of Navy and contractor resources by encouraging the teamwork of all parties in the process.

TABLE VIII

RESPONSE TO STATEMENT B4b SMOOTHER CONTRACTOR/NAVY INTERFACE UNDER CQC THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	10	2	20	1	10	6	60	0	0	10	6
NORTHDIV	8	26	7	23	0	0	13	42	3	10	31	20
LANTDIV	17	16	12	27	1	2	13	29	2	4	45	29
SOUTHDIV	8	24	12	36	1	3	11	33	1	3	33	21
WESTDIV	7	19	11	30	3	8	11	30	5	14	37	24
TOTAL	41	26	44	28	6	4	54	34	12	8	157	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	3	60	1	20	0	0	1	20	0	0	5	14
NORTHDIV	2	29	2	29	0	0	1	14	2	29	7	19
LANTDIV	0	0	3	50	0	0	1	27	2	33	6	17
SOUTHDIV	2	40	3	60	0	0	0	0	0	0	5	14
WESTDIV	4	31	4	31	0	0	1	8	4	31	13	36
TOTAL	11	31	13	36	0	0	4	11	8	22	36	

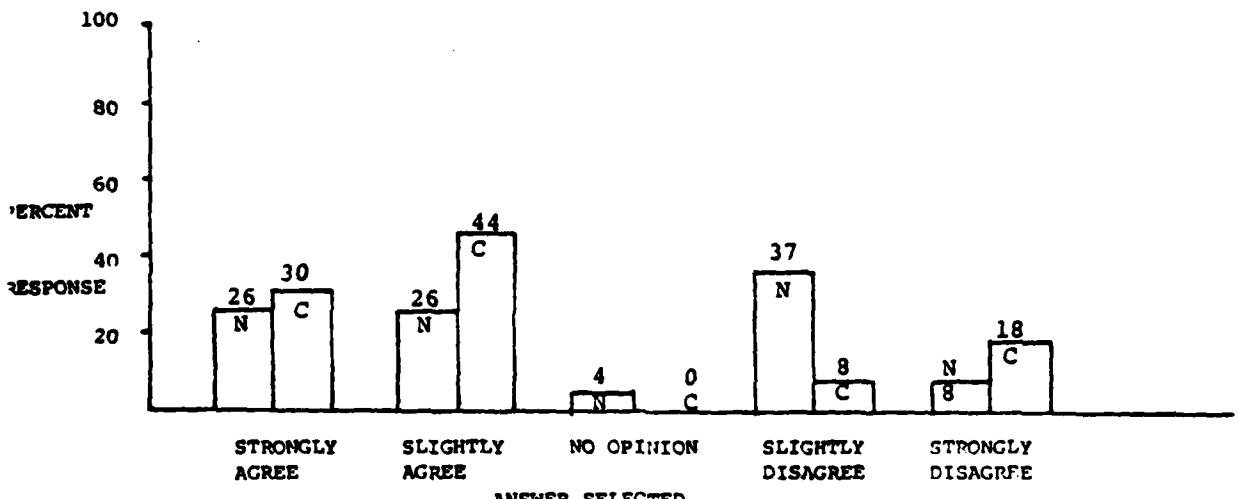


Figure 5. Response to Statement B4b.

9. Section B, Statement 4c - CQC usually reduces the time necessary for submission of approved material cuts, progress payment requests, correspondence, etc.

Response to the statement that CQC reduces the administrative aspects of a contract was mixed as evidenced by the data displayed in Table IX and Figure 6. The only significant tendency was found in SOUTHDIV responses, where a strong majority of respondents (63%) disagreed. In all other EFD's a slight majority of respondents agreed. The indications are, therefore, that a small majority of Navy personnel do indeed perceive a time savings resulting from CQC contracting.

Interestingly, most contractors sided with SOUTHDIV on this issue, with sixty-three percent (63%) disagreeing. Contractor disagreement was consistent throughout the EFD's.

Contractor dissatisfaction with this aspect of the program, as demonstrated through the survey results, probably stems more from the frustration in dealing with Government rules, regulations, and report requirements than from any other source. The Government's proclivity for documents and chronicles is well established, and can certainly seem excessive to the average contractor. Usually not considered, however, are the potential cost savings and benefits that can be derived from an accurate and complete reporting system. Not only can Government reports be properly prepared, but also tax payments can be justified, losing cost centers can be

recognized, and areas where bid price estimates were inaccurate can be identified. Proper financial and other record keeping can therefore benefit the contractor if he is sharp enough to recognize its advantages [Ref. 13].

Previous research obtained similar results on the Navy side, showing a fifty-seven percent (57%) agreement with the statement [Dean, 1974]. Contractors, however, also agreed with the statement in the previous research (68%). Six years of additional CQC experience seems to have shifted contractor opinion on this issue from a positive to a negative perspective.

TABLE IX

RESPONSE TO STATEMENT B4c — REDUCED SUBMITTAL TIME UNDER CQC THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	11	1	11	1	11	4	44	2	22	9	6
NORTHDIV	7	22	5	16	2	6	11	34	7	22	32	21
LANTDIV	8	17	9	20	4	9	18	39	7	15	46	29
SOUTHDIV	6	18	15	45	2	6	7	21	3	9	33	21
WESTDIV	7	20	4	12	1	3	13	37	10	29	35	22
TOTAL	29	19	34	22	10	6	53	34	30	19	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	1	20	0	0	0	0	0	0	5	4
NORTHDIV	2	25	2	25	1	13	1	13	2	25	8	22
LANTDIV	3	50	1	27	0	0	1	27	1	27	6	16
SOUTHDIV	1	20	2	40	1	20	1	20	0	0	5	4
WESTDIV	3	23	4	31	0	0	1	8	5	38	13	35
TOTAL	13	35	10	27	2	5	4	11	8	22	37	

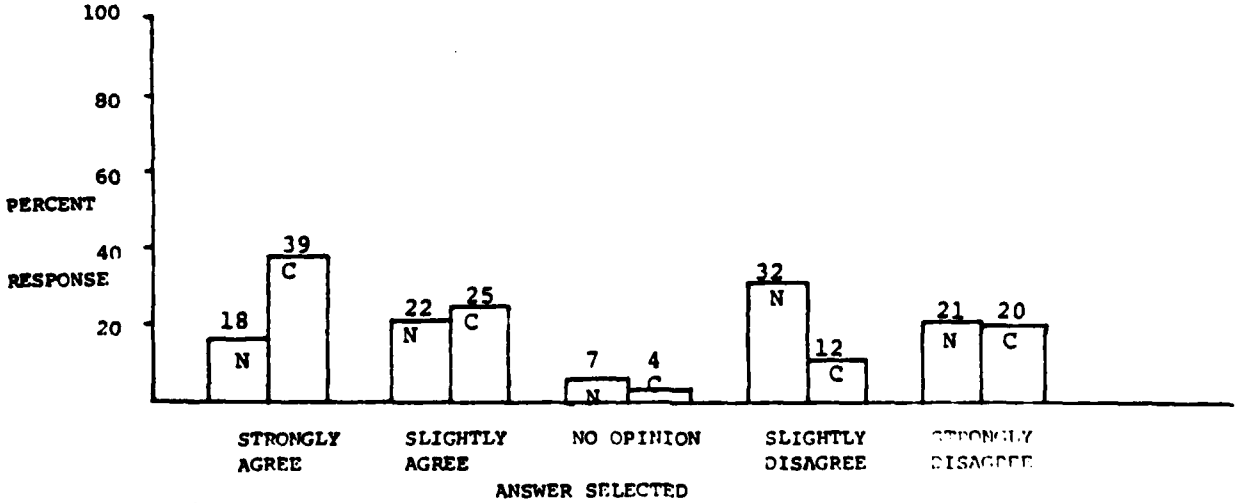


Figure 6. Response to Statement B4c.

10. Section B, Statement 4d - CQC provides adequate flexibility to the contractor to control his job progress and allows the contractor to recognize potential problems sooner than non-CQC.

Response to this statement is displayed in Table X and Figure 7. There is a strong similarity between this and the previous statement. A small majority of Navy respondents (51%) agreed that CQC does provide flexibility to the contractor; however, both SOUTHDIV and the majority of contractors disagree at a rate of sixty-one percent (61%).

The reason for the contractor's lack of agreement with this and the previous statement may lie in what appears to many contractors to be the major contradiction of the CQC program. As one company president explains it, a contractor who wishes to fulfill the requirements of CQC will exhaust considerable effort selecting a competent CQC representative and developing a CQC system that is acceptable to the Navy. The Navy, however, retains total approval authority on all aspects of construction. The contractor, through the CQC representative, can develop adequate, good-faith decisions about material, equipment, or construction methods, only to have them overturned by the Navy, often with insufficient justification. The environment that develops, therefore, is one where the contractor makes construction choices based on the perceived reactions of the Navy rather than on the real

demands of the contract: inefficiency and frustration ultimately evolves.

A second possible reason for the contractor's disagreement may lie in the chain of command forced on the contractor by the CQC program. Under CQC, quality is controlled by the CQC representative, and production is the responsibility of the job superintendent. The two positions, however, if they do not work together closely enough, will develop a definite jobsite conflict since the one is pushing for the expeditious (and profitable) earliest completion of the contract, while the other is often promoting delays in the construction process to enable the Navy to inspect and accept work in place before it is covered in order to avoid rework.

A shift for the worse in contractor attitudes has evidently occurred since the previous survey since past response indicated that the majority of contractors agreed that CQC provided flexibility [Ref. 10].

From the responses received, therefore, it appears that Navy respondents perceive the CQC program to provide flexibility and foresight to the contractor, while contractors, on the other hand, do not receive the reinforcement that should be forthcoming in these areas. Since the dissatisfaction has increased, the Navy may be well-advised tc reevaluate the real responsibilities given to the CQC contractor in an effort to provide a program where the contractor can be made to feel that he is a contributing member to the quality picture.

TABLE X

RESPONSE TO STATEMENT B4d GREATER CONTRACTOR JOB FLEXIBILITY UNDER CQC THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER PESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	10	1	10	1	10	4	40	3	30	10	6
NORTHDIV	7	23	4	13	0	0	14	45	6	19	31	20
LANTDIV	9	20	10	22	3	7	13	29	10	22	45	29
SOUTHDIV	9	26	12	35	4	12	4	12	5	15	34	22
WESTDIV	7	19	7	19	3	8	13	36	6	17	36	23
TOTAL	33	21	34	22	11	7	48	31	31	20	157	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	1	20	0	0	0	0	0	0	5	14
NORTHDIV	3	43	0	0	1	14	1	14	2	29	7	19
LANTDIV	1	27	2	33	0	0	2	33	1	27	6	17
SOUTHDIV	1	20	3	60	0	0	1	20	0	0	5	14
WESTDIV	3	23	3	23	0	0	5	38	2	15	13	36
TOTAL	12	33	9	25	1	3	9	25	5	14	36	

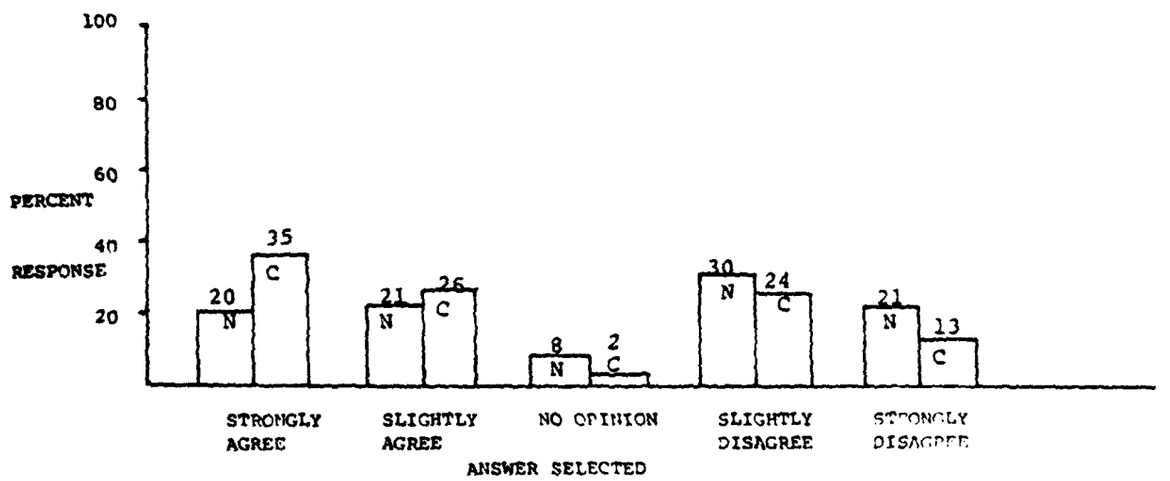


Figure 7. Response to Statement B4d.

11. Section B, Statement 4e - CQC contracts experience more problems or delays than non-CQC.

Although the response to this statement from the highest scoring individuals was evenly distributed, the general trend throughout the Navy, within each EFD, and among contractors, indicated disagreement. Table XI and Figure 8 illustrate. Although only fifty-one percent (51%) of the Navy response showed disagreement, twenty-four percent (24%) had no opinion, while the remaining twenty-four percent (24%) agreed. Weighted, the response is even more heavily in favor of disagreement (55%). Weighted, contractor response also increased in favor of disagreement (54% to 58%).

There are two possible explanations for this response. First, the large percentage of respondents choosing no opinion on this issue could indicate either a lack of comparative experience between CQC and non-CQC contracts, or the possibility that a "no opinion" answer to this statement represented the choice that problems and delays on the two types of construction were perceived to be about the same. Second, since only about ten percent (10%) of the response indicated strong agreement, the real possibility exists that CQC is indeed more problem-free than non-CQC construction.

The two possibilities are therefore reduced to a choice between an equal degree of problems and delays or CQC being the least problem-prone, with the evidence indicating

the latter. If the data are interpreted correctly, CQC does fulfill its goal of reducing the number of problems encountered in the construction of Navy facilities.

Improvement is possible, however, and one area where a reevaluation of procedures could be performed is in the lattitude given by the Navy to the contractor in his interpretation of the contract plans and specifications. As one CQC company vice-president explained, design is usually accomplished by an independent Architect and Engineer (designer), with review by the Navy, both within the EFD and also at the customer level. It is so cumbersome to try to arrange a change in the construction process that many field offices and EFD's have adopted the unyielding attitude of "do it by the specs" without regard for the benefits of the proposed change. Contractors, therefore, may have become reluctant to suggest improved construction methods or materials, and both innovation and quality therefore suffer.

TABLE XI

RESPONSE TO STATEMENT **B4e** INCREASED DELAYS UNDER CQC THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	3	30	2	20	3	30	2	20	0	0	10	6
NORTHDIV	10	32	11	35	4	13	2	6	4	13	31	20
LANTDIV	7	16	11	24	14	31	10	22	3	7	45	29
SOUTHDIV	5	15	10	30	9	27	7	21	2	6	33	21
WESTDIV	7	19	13	36	8	22	3	8	5	14	36	23
TOTAL	33	21	47	30	38	24	24	15	14	9	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	1	20	1	20	2	40	1	20	0	0	5	14
NORTHDIV	3	43	0	0	0	0	2	29	2	29	7	19
LANTDIV	0	0	4	66	2	33	0	0	0	0	6	17
SOUTHDIV	0	0	2	40	0	0	2	40	1	20	5	14
WESTDIV	6	46	3	23	1	8	0	0	3	23	13	36
TOTAL	10	27	10	27	5	14	5	14	6	17	36	

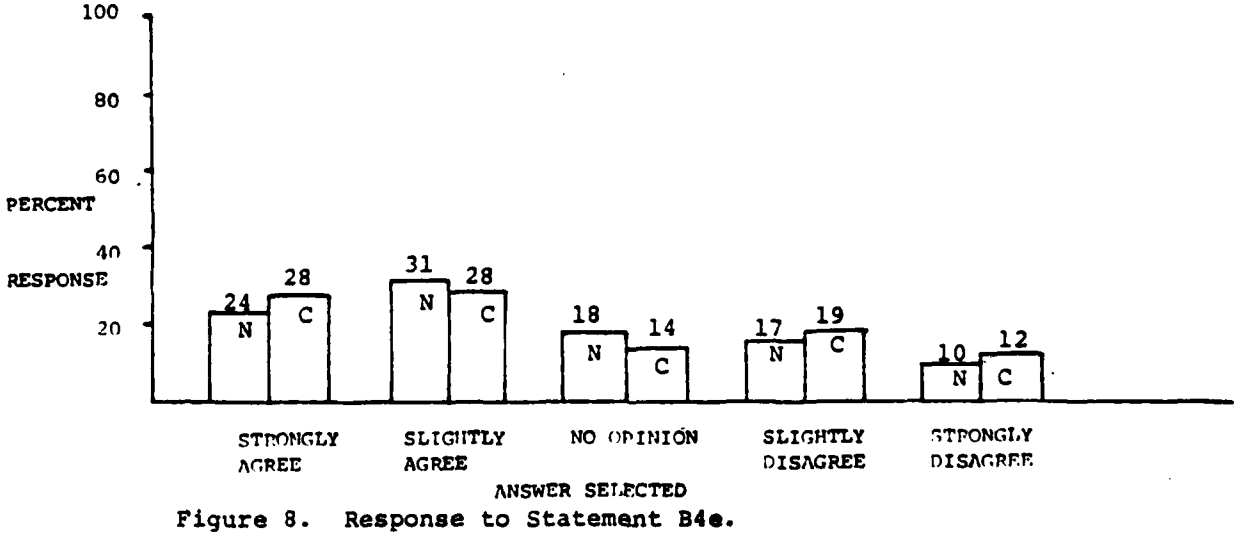


Figure 8. Response to Statement B4e.

12. Section B, Statement 4f - The finished product under CQC is better than under non-CQC.

Table XII and Figure 9 display the response to this statement. Fifty-three percent (53%) of the Navy respondents and forty-six percent (46%) of the contractors (both majorities) disagree that the finished product under CQC is superior to that of non-CQC. Of the five high scorers voicing an opinion, three disagreed. The NAVFAC response, however, was strong agreement. In a manner similar to the response to the previous statement, a large percentage of the respondents (23% Navy and 22% contractor) had no opinion. Since only twenty-five percent (25%) of the Navy response and thirty-one percent (31%) of the contractor response indicated any amount of agreement, it can safely be surmised that CQC construction is perceived no better than non-CQC considering only the finished product. This premise is supported in the weighting where both Navy and contractors increased in disagreement. Previous research indicated a strong preference within the Navy for Navy-inspected non-CQC contracting (83%) [Ref. 10].

The reasons that CQC is not perceived to provide better finished quality than non-CQC are many. From the Navy's viewpoint, the choice is between contractor inspection under CQC and Navy inspection under non-CQC. Certainly the Navy respondent may view the finished product resulting from his own efforts in a different light than the finished product presented by the contractor. Additionally, it should be noted

that most contracts in excess of one million dollars have been awarded under CQC. Respondent comparisons of CQC and non-CQC construction were therefore made based on two different construction scales of effort. On the other side of the coin, under non-CQC conditions, the Navy exerts a much greater control over the construction effort, and the Navy response provided herein may indeed reflect the view that quality increases proportionally to the amount of owner control exerted.

From the contractor's point of view, the choice is similar. By allowing that quality is better under CQC conditions, the contractor admits that quality is less in other cases. Certainly no self-respecting contractor will willingly admit that the ever-present Navy inspector is essential to his providing quality work.

The conclusion would seem to be that the most that can be expected of CQC construction is quality equal to that of non-CQC. Allowing that the Navy can provide an acceptable finished product using its own inspection forces, this conclusion is probably not unreasonable.

TABLE XII

RESPONSE TO STATEMENT B4f — BETTER FINISHED PRODUCT UNDER CQC THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0	0			0		0		1		1	1
CHESDIV	1	10	1	10	4	40	4	40	0	0	10	6
NORTHDIV	5	16	7	23	7	23	10	32	2	6	31	20
LANTDIV	20	44	9	20	8	18	4	9	4	9	45	29
SOUTHDIV	17	52	5	15	8	24	2	6	1	3	33	21
WESTDIV	7	19	10	28	9	25	6	17	4	17	36	23
TOTAL	50	32	32	21	36	23	26	17	12	8	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	2	40	1	20	0	0	2	40	0	0	5	14
NORTHDIV	3	43	0	0	3	43	0	0	1	14	17	19
LANTDIV	1	27	2	33	1	27	2	33	0	0	6	17
SOUTHDIV	1	20	1	20	1	20	2	40	0	0	5	14
WESTDIV	3	23	3	23	3	23	3	23	1	8	13	36
TOTAL	10	27	7	19	8	22	9	25	2	6	36	

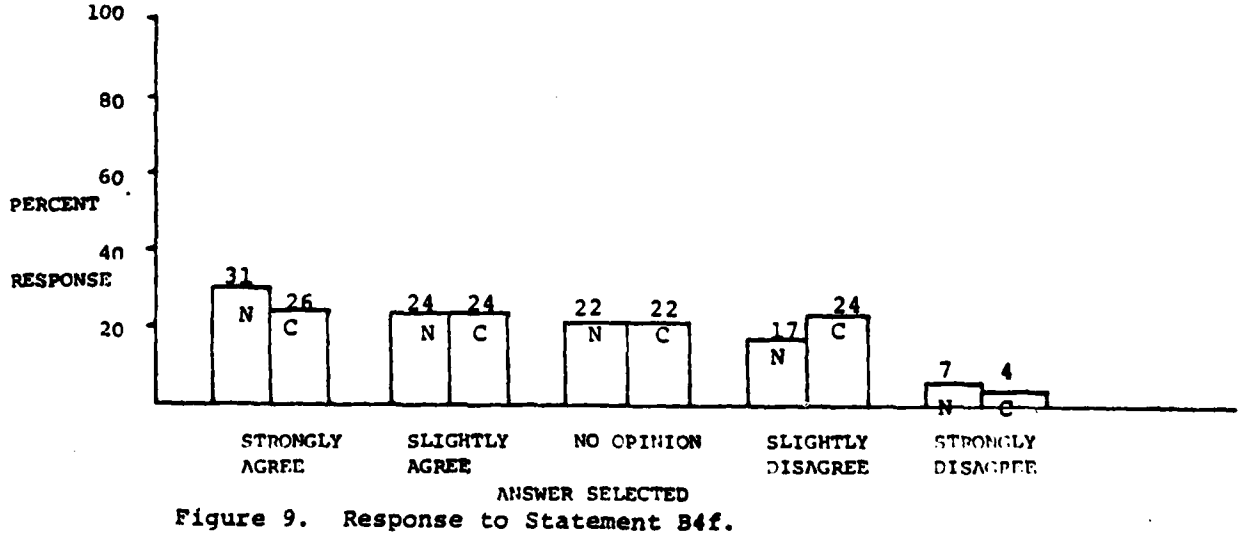


Figure 9. Response to Statement B4f.

13. Section B, Statement 4g - There is a conflict of interest inherent to CQC since the contractor inspects himself.

Eighty-four percent (84%) of the Navy respondents and sixty-six percent (66%) of the contractors agreed that CQC produces an inherent conflict of interest. Four of the five high scorers also agreed, although NAVFAC strongly disagreed. Belief that there is a conflict of interest has increased significantly; previous research indicated only fifty-nine percent (59%) agreement from the Navy and fifteen percent (15%) agreement from the contractors [Ref. 10]. Weighting did not change the response percentages.

The strength of the response is evidenced not only by the results shown in Table XIII and Figure 10, but also in the number and intensity of respondent comments written concerning this topic. One SOUTHDIV ROICC summed up the general feelings when he wrote, "No man can serve two masters." Since the CQC representative is hired, paid, and fired by the contractor, the only logical recipient of his loyalty is the contractor. Many respondents, contractors among them, felt it unsophisticated for the Navy to expect the CQC representative to side with the Navy on a quality issue, particularly if the issue has a potential cost to the contractor.

The president of one CHESDIV contracting firm voiced a particularly strong view of the conflict of interest, and went on to call CQC a joke, a waste of time and tax money, and a typical example of non-essential Government paper work.

Certainly the premise that CQC promotes a conflict of interest is unavoidable. Rather than bemoaning this fact, it would be wise to examine the ways in which this conflict can be used to the Navy's advantage.

For the Navy, CQC is a fact of life, and according to NAVFAC, CQC will continue to be the dominant form of contracting for as long as can be foreseen. Therefore, it is in the best interest of the Navy to ensure that the CQC representative and operating system provided by the contractor is the one best able to provide quality. Forcing the contractor to comply with the CQC provision, even to the point of having the CQC representative removed from the contract, is the only real course of action available to the Navy if it is to develop credibility and make the best of the present environment [12].

If the Navy gets tough, contractors, recognizing the resolve of the Navy to ensure CQC compliance, will no longer submit unqualified personnel or inadequate quality systems for approval, and the Navy will realize the benefit of working in the best possible CQC environment. The use of CQC as a medium to ensure quality rather than as a fulfillment of a Government requirement may therefore result.

TABLE XIII

. RESPONSE TO STATEMENT B4g CQC CONFLICT OF INTEREST

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	2	22	0	0	1	11	1	11	5	56	9	5
NORTHDIV	2	10	4	20	0	0	11	55	14	70	31	20
LANTDIV	1	2	2	4	0	0	8	18	34	76	45	29
SOUTHDIV	3	9	2	6	0	0	6	18	22	67	33	21
WESTDIV	4	11	1	3	2	5	11	30	19	51	37	24
TOTAL	13	8	9	6	3	2	37	24	94	60	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	1	20	0	0	0	0	2	40	2	40	5	14
NORTHDIV	0	0	1	14	0	0	2	29	4	57	7	19
LANTDIV	0	0	2	33	1	27	1	27	2	33	6	17
SOUTHDIV	0	0	0	0	2	40	2	40	1	20	5	14
WESTDIV	3	23	1	8	1	8	1	8	7	54	13	36
TOTAL	4	11	4	11	4	11	8	22	16	44	36	

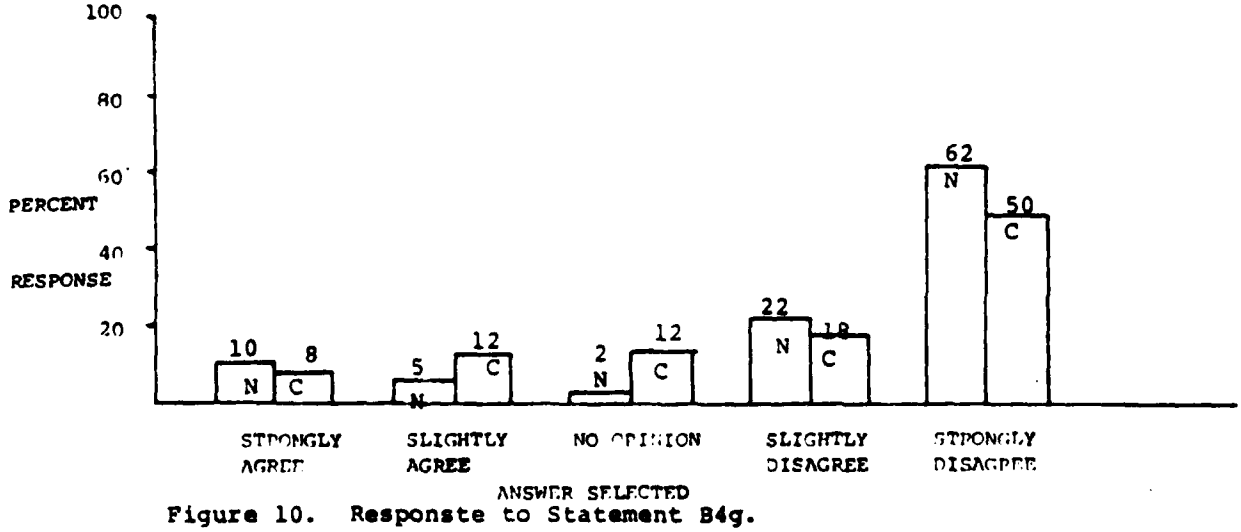


Figure 10. Responste to Statement B4g.

14. Section B, Statement 4h - CQC representatives are usually sufficiently qualified to perform the specified CQC function.

Navy and contractor response, as evidenced by Table XIV and Figure 11, was somewhat opposite regarding whether the CQC representative is usually sufficiently qualified. Navy respondents disagreed by fifty-nine percent (59%) while contractors agreed by fifty-one percent (51%). Four of six EFD high scorers agreed with the Navy majority, however NAVFAC and seventy percent (70%) of the CHESDIV response believed that CQC representatives were usually qualified. Weighting did not alter the results.

The reasons for Navy disagreement are many. One LANTDIV Assistant Resident Officer in charge of construction (AROICC) responded that most CQC representatives are underqualified and usually not sufficiently expert in enough areas to realize quality mistakes. The fact that most CQC individuals may not possess sufficient construction experience could also manifest itself in a lack of forcefulness by the CQC representative in his dealings with the contractor foremen and craftsmen.

Another problem related to CQC qualifications is found in the review of submittals. A SOUTHDIV Area Coordinator explained that since the CQC representative was usually not qualified to review all material cuts, extensive backchecking was performed by the Navy for all CQC contracts.

On many complex items SOUTHDIV has eliminated CQC review and approval altogether.

Further complicating the issue is the fact that there is no construction-wide demand for CQC individuals; therefore finding an employee qualified to be a competent CQC representative is quite difficult. Since there is no demand for CQC personnel, it follows that individuals working in this field do not have sufficient influence to fully execute the CQC function, nor do they have sufficient prestige to command the wages incident to a reasonable job.

What are the qualifications of a competent CQC representative? One contractor facetiously defined the characteristics of a good CQC man as being blind, partially deaf, but being able to type like hell. The true Quality Control professional needs a myriad of talents, among them inquisitiveness, writing skill, analytical ability, the ability to read and interpret plans and specifications, and most of all, a basic interest in producing a quality product [Ref. 15].

Since Navy construction is of a non-repetitive nature, and since the qualities of a good CQC representative are mostly unmeasurable, it may not be possible ever to reach the point where each contract is accompanied by a detailed specification defining the CQC representative acceptable to the Navy. However, efforts could be made to reduce the number of conflicts resulting from the lack of qualifications on the part of the CQC individual by closely examining the scope of each contract

and specifying the minimum experience level acceptable for the CQC. Using guidelines of this sort, the contractor should submit for approval an individual who will be able to intelligently discuss the construction with both the Navy and the contractor's production employees.

TABLE XIV

RESPONSE TO STATEMENT B4h SUFFICIENT QUALIFICATIONS OF CQC REPRESENTATIVE

NAVY RESPONSE

	ANSWER SELECTED											
	STPONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	10	1	10	1	10	5	50	2	20	10	5
NORTHDIV	6	19	11	35	1	3	11	35	3	10	31	20
LANTDIV	17	38	11	24	2	4	13	29	2	4	45	29
SOUTHDIV	7	21	13	39	1	3	11	33	1	3	33	21
WESTDIV	12	32	13	35	5	14	6	16	1	3	37	24
TOTAL	43	28	49	31	10	6	46	29	10	6	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	1	20	0	0	1	20	3	60	0	0	5	14
NORTHDIV	0	0	2	25	2	25	4	50	0	0	8	22
LANTDIV	0	0	1	27	1	27	4	66	0	0	6	16
SOUTHDIV	0	0	3	60	0	0	2	40	0	0	5	14
WESTDIV	5	38	1	8	1	8	4	31	2	15	13	35
TOTAL	6	16	7	19	5	14	17	46	2	5	37	

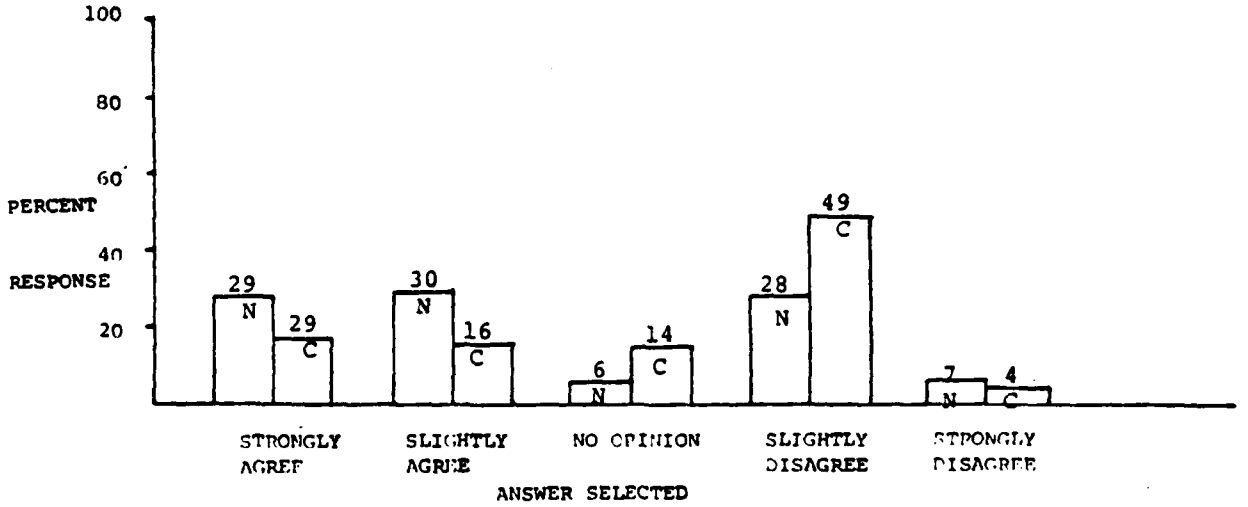


Figure 11. Response to Statement B4h.

15. Section B, Statement 4i - CQC contracts are better designed than non-CQC.

As the results displayed in Table XV and Figure 12 indicate, respondents tended to disagree that CQC and non-CQC designs are different. Sixty-one percent (61%) of the Navy response, seventy-four percent (74%) of the contractor response, and all EFD high scorers except NAVFAC disagreed. Of significance is the fact that thirty-one percent (31%) of the Navy respondents and twenty percent (20%) of the contractor respondents answered "no opinion" suggesting that there may be no perceived difference in design between the two processes. Weighting increased the contractor disagreement level to seventy-nine percent (79%)

Design, as one WESTDIV AROICC stated, is a facet of the CQC program that should not be forgotten, since it is the one aspect of the construction process that directly and continually impacts on the effectiveness of the CQC system. Design defines the nature of the project, CQC interprets the design. A quality design will necessarily result in quality completed construction since the better the design, the fewer the problems the Navy and the contractor have to face.

If, as the survey indicates, design of CQC and non-CQC contracts are performed equally, it may be profitable for the Navy to examine the design process as it directly impacts on quality, and revise it to provide the best possible quality product.

There is much literature available that supports the premise that whatever is done to improve the quality of the design will result in cost savings and other benefits for the owner. Although it may sound a little facetious, the institution of a workable Design Quality Control (DQC) system at each EFD and NAVFAC would accomplish this purpose, and the savings effected from the resulting reduction of change orders and claims may make better design review cost effective.

TABLE XV

RESPONSE TO STATEMENT B4i BETTER DESIGN OF CQC CONTRACTS THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		1		0		1	1
CHESDIV	5	50	0	0	5	50	0	0	0	0	10	6
NORTHDIV	14	44	6	19	11	34	1	3	0	0	32	20
LANTDIV	21	47	5	11	12	27	5	11	2	4	45	29
SOUTHDIV	19	58	3	9	10	30	0	0	1	3	33	21
WESTDIV	20	56	4	11	10	28	2	6	0	0	36	23
TOTAL	79	50	18	11	48	31	9	6	3	2	157	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	3	60	2	40	0	0	0	0	0	0	5	14
NORTHDIV	2	29	1	14	3	43	1	14	0	0	7	20
LANTDIV	3	50	1	27	2	33	0	0	0	0	6	17
SOUTHDIV	3	60	1	20	1	20	0	0	0	0	5	14
WESTDIV	10	83	0	0	1	13	1	13	0	0	12	34
TOTAL	21	60	5	14	7	20	2	6	0	0	35	

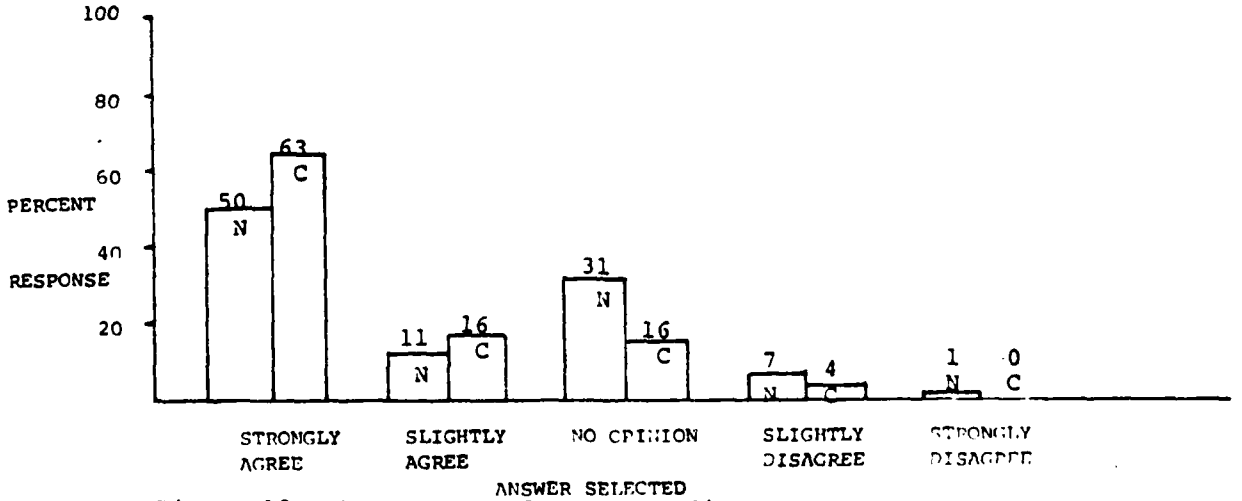


Figure 12. Response to Statement B4i.

16. Section B, Statement 4j - Contractors usually allow the CQC representative free rein in performing his duties.

Response to this statement indicated that the Navy and the contractors are opposed in their attitudes toward how much responsibility the contractor allows the CQC representative. Seventy-nine percent (79%) of the Navy respondents and five of the EFD high scorers disagreed while fifty-four percent (54%) of the contractors and NAVFAC agreed. CHESDIV and SOUTHDIV with ninety percent (90%) and ninety-four percent (94%) disagreement were particularly strong-voiced in their opinions. Weighting significantly reduced the amount of contractor agreement to forty-two percent (42%). Table XVI and Figure 13 apply.

The reasons for this response were probably related to the response given previously to statement 4g. regarding the inherent conflict of interest in the CQC program. In order to ensure profits, many contractors will resort to threats and intimidation to motivate the CQC representative toward inaction on quality problems. One of the most frustrating situations facing the Navy can be found where a competent CQC is harassed by his employer for being overzealous. Presently there are no means for the Navy to protect and retain the effective CQC individual.

Another reason for the Navy response is found in the contractor's use of the CQC representative. Often, in order to more fully utilize the CQC's time, the contractor will

provide him additional collateral duties in line with company management and not the CQC function. Another tact sometimes taken by the contractor is to list clearly the duties of the CQC representative on paper while in reality diluting his actual authority to act.

By reducing the responsibilities of the CQC individual, however, contractors are ignoring one of the most important rules of business, that when an employee is responsible for the success or failure of some aspect of an operation, he must also be provided power or authority sufficient to accomplish his goals. In construction this rule is doubly true since work moves so fact that delay in action can be costly [Ref. 16].

Understanding that the CQC program is only as effective as the weakest CQC representative, it therefore behooves the Navy and the contractor to take action to strengthen the authority and responsibility of the CQC representative.

TABLE XVI

RESPONSE TO STATEMENT 4Bj

CQC REPRESENTATIVES OPERATE FREELY

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	6	60	3	30	0	0	1	10	0	0	10	6
NORTHDIV	13	40	6	19	4	13	8	25	1	3	32	20
LANTDIV	28	62	11	24	0	0	5	11	1	2	45	28
SOUTHDIV	21	64	10	30	1	3	1	3	0	0	33	21
WESTDIV	17	46	9	25	5	14	4	11	2	6	37	23
TOTAL	85	54	39	25	10	6	19	12	5	3	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	0	0	1	20	0	0	2	40	2	50	5	14
NORTHDIV	1	14	0	0	1	14	3	43	2	29	7	19
LANTDIV	0	0	0	0	4	57	2	29	1	14	7	19
SOUTHDIV	1	20	2	40	0	0	2	40	0	0	5	14
WESTDIV	1	8	6	46	0	0	4	31	2	15	13	35
TOTAL												

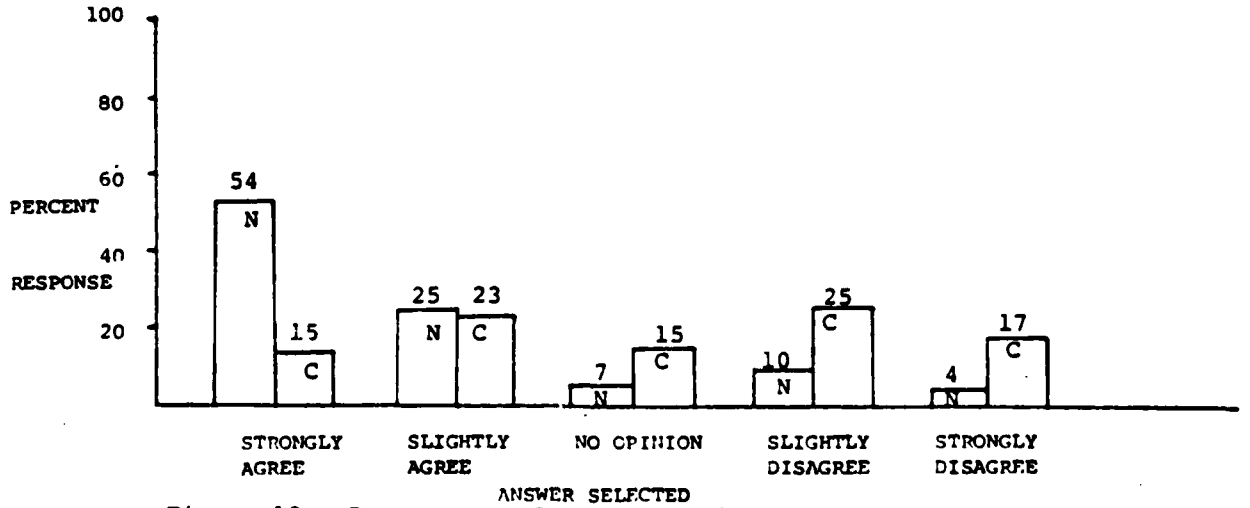


Figure 13. Response to Statement 4Bj.

17. Section B, Statement 4k - A complete, usable CQC plan is vital to the proper performance of CQC.

Eighty-three percent (83%) of the Navy respondents including every high scorer agreed with the importance of a usable CQC plan. Contractors also agreed, but at a rate of fifty-eight percent (58%). The strength of the response can be seen in Table XVIII and Figure 14. Not only was the response on the agreement side of the matrix, but the majority of all respondents, regardless of EFD, and all five high scorers indicated strong agreement. Weighting did not significantly alter the response.

Previous research evidenced fifty-two percent (52%) Navy and fifty-seven percent (57%) contractor agreement with the statement, indicating a general strengthening in the belief that the CQC plan, when properly submitted and reviewed, can be a valuable management tool [Ref. 10].

The reason that the CQC plan has been identified as one of the most important features of the CQC program can be examined. Clause 76 of the contract General Provisions specifically defines the plan and its contents. The requirements of the plan are clearly a Management-by-Objectives product. Each aspect of the CQC program has been defined and related to a specific section of the CQC plan, thus making the CQC plan, if properly prepared, an extensive document setting down in writing the contractor's actions and responsibilities

regarding CQC in its entirety. The plan thus becomes the means for the contractor to show the Navy that his specific intentions to provide a quality product, and for the Navy to demonstrate its faith in the contractor's methods and quality management ability.

TABLE XVII

RESPONSE TO STATEMENT **B4k**

USEFULNESS OF CQC PLAN

NAVY RESPONSE

	ANSWER SELECTED											
	STPONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STPONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	10	0	0	0	0	2	20	7	70	10	6
NORTHDIV	0	0	3	9	2	6	7	22	20	63	32	20
LANTDIV	0	0	3	7	2	4	10	22	30	67	45	28
SOUTHDIV	3	9	2	6	1	3	5	15	22	67	33	21
WESTDIV	2	6	4	11	4	11	4	11	23	62	37	23
TOTAL	6	4	12	8	9	6	28	18	103	65	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	3	60	0	0	0	0	2	40	0	0	5	14
NORTHDIV	1	14	1	14	1	14	2	28	2	28	7	19
LANTDIV	1	27	0	0	1	27	3	50	1	27	6	17
SOUTHDIV	0	0	0	0	0	0	4	80	1	20	5	14
WESTDIV	2	15	4	31	1	8	2	15	4	31	13	36
TOTAL	7	19	5	14	3	8	13	36	8	22	36	

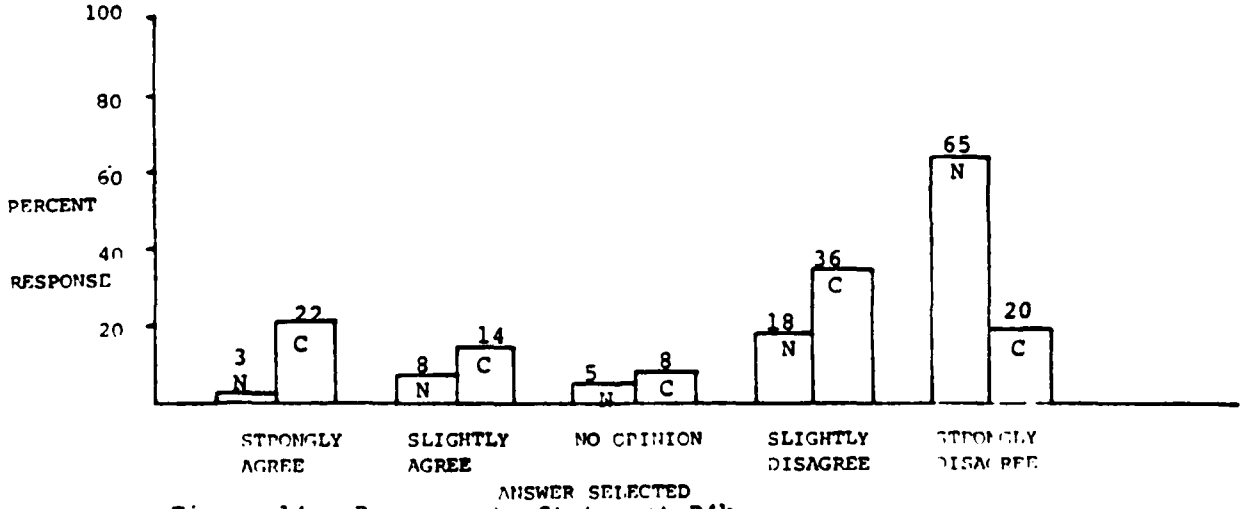


Figure 14. Response to Statement B4k.

18. Section B, Statement 41 - Navy personnel usually understand the requirements of the CQC program.

Navy respondents agreed by sixty-seven percent (67%) that Navy personnel understand CQC. Four of the six EFD high scorers also noted agreement, and contractor response favored the statement by fifty-three percent (53%). Overall the response throughout EFD's was consistent except that NORTHDIV contractors disagreed at a rate of fifty-seven percent (57%). Table XVIII and Figure 15 apply.

A comparison with previous research indicated an increase in the amount of agreement from both Navy and contractor respondents, the Navy up from fifty-five percent (55%), contractors up from forty-eight percent (48%) [Ref. 10]. Weighting did not change the response.

One of the most interesting results of this research directly relates to this subject. In only nine (9) of twenty (20) cases did the response of NAVFAC agree with the majority of respondents, and in only twelve (12) cases did NAVFAC agree with the majority of the EFD high scorers. It would therefore seem that NAVFAC is isolated from the attitudes of the EFD. In reality, however, the opposite is more likely the case. Most field office personnel are prone to base an opinion or attitude on very few career experiences with a limited number of CQC problems. NAVFAC personnel, on the other hand, can usually speak from a wide range of experience, and the fact

that NAVFAC's responses are generally those to be expected from a strong proponent of CQC, is not unrealistic. At the NAVFAC level, these attitudes and perceptions may be correct.

The problem demonstrated, however, is how to bridge the gap between NAVFAC and the field; that is, how to provide Navy-wide construction information to all parties in the CQC process, how to demonstrate that CQC can work if properly administered, and most important of all, how to make available to all parties the methods that NAVFAC and the field offices have employed to solve specific CQC problems.

TABLE XVIII

RESPONSE TO STATEMENT B41 NAVY UNDERSTANDING OF CQC REQUIREMENTS

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		1		0		1	1
CHESDIV	1	10	2	20	2	20	2	20	3	30	10	6
NORTHDIV	1	3	4	13	3	9	14	44	10	31	32	20
LANTDIV	5	11	9	20	0	0	17	38	14	31	45	28
SOUTHDIV	3	9	7	21	1	3	12	36	10	30	33	21
WESTDIV	6	16	6	16	3	8	13	34	10	26	38	24
TOTAL	16	10	28	18	9	6	59	37	47	30	159	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	1	20	0	0	2	40	2	40	0	0	5	14
NORTHDIV	1	14	3	43	1	14	1	14	1	14	7	19
LANTDIV	1	17	0	0	0	0	5	83	0	0	6	17
SOUTHDIV	0	0	1	20	0	0	4	80	0	0	5	14
WESTDIV	2	15	4	31	1	8	3	23	3	23	13	36
TOTAL	5	14	8	22	4	11	15	42	4	11	36	

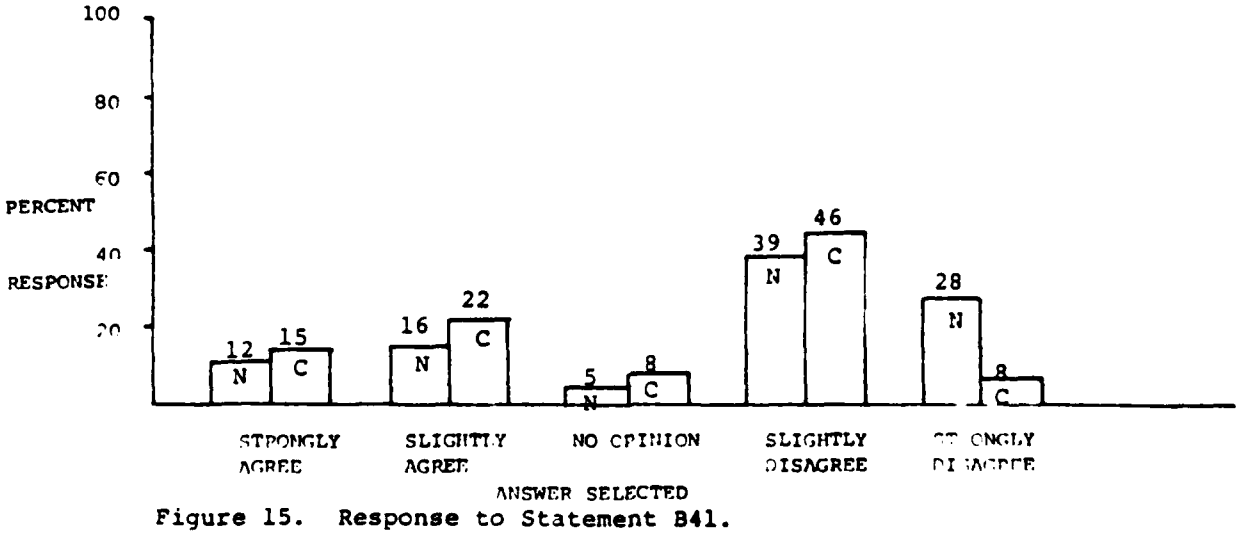


Figure 15. Response to Statement B41.

19. Section B, Statement 4m - The qualifications of the CQC representative should be specified in the contract.

Eighty-seven percent (87%) of the Navy respondents, including five of six EFD high scorers, and fifty-seven percent (57%) of the contractors agreed that CQC qualifications should be specified. Only NAVFAC disagreed. Response was consistent throughout each EFD, as Table XIX and Figure 16 show.

Interestingly, previous research showed the Navy and contractors in exact agreement at sixty-seven percent (67%) indicating an increase in the Navy agreement level and a decrease in the contractor agreement level. Weighting reduced the strength of the Navy agreement to eighty-five percent (85%) and the contractor response also lessened (52%).

The response to this particular statement showed the highest level of agreement to any attitude statement in the questionnaire. The reasons given for the response were typically that the contractor usually provided anyone from a journeyman craftsman to a newly-graduated engineer, to a retired construction foreman to fill the CQC position. On paper, justification could be made for any of these individuals to be the CQC representative, yet the wide range of experience and skill would indicate a vast difference in each one's potential attitude toward performance of CQC and of the CQC function.

Attempts to specify the exact qualifications of a competent CQC are usually unrewarding. Some persons prefer an

individual with extensive construction experience, while others identify education and management expertise as the prime skills. Still others favor the CQC meeting minimum levels of competence in all aspects of the potential contract. As identified by the analysis of statement 4h, however, there is really only one attribute shared by all good quality control individuals and that is the willingness to demand a quality finished product.

Here again NAVFAC's response is enlightening. When asked to comment on this issue, Paul Pleisance, NAVFAC's CQC expert, identified the major problem in defining the qualifications of the CQC representative as a legal one. In essence, previous court decisions have shown that, where the Government has attempted to specify the qualifications of the contractor's CQC representative, and accepted a specific individual who meets these qualifications, removal of that individual for any reason other than a most serious violation of the CQC program has been almost impossible. NAVFAC has had good experience, on the other hand, forcing the removal of marginally unsatisfactory CQC's so long as the contractor retains the responsibility for providing competent CQC personnel.

The situation again surfaces where valid reasons exist for a NAVFAC policy, yet there is a perceived lack of action on NAVFAC's part evident at the field level resulting from not disseminating these reasons. Communication and education could therefore be identified as the necessary, but often forgotten, aspects of the CQC process.

TABLE XIX

RESPONSE TO STATEMENT B4m

BETTER CQC QUALIFICATIONS SPECIFICATIONS

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	0	0	1	10	0	0	3	30	6	60	10	6
NORTHDIV	2	6	0	0	1	3	9	28	20	63	32	20
LANTDIV	1	2	0	0	5	11	7	16	32	71	45	28
SOUTHDIV	3	9	0	0	2	6	6	18	22	67	33	21
WESTDIV	0	0	2	6	3	8	3	8	29	78	37	23
TOTAL	7	4	3	2	11	7	28	18	109	69	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	1	20	1	20	0	0	2	40	1	20	5	14
NORTHDIV	3	43	1	14	2	28	0	0	1	14	7	19
LANTDIV	1	17	0	0	0	0	3	50	2	33	6	17
SOUTHDIV	0	0	1	20	1	20	1	20	2	40	5	14
WESTDIV	0	0	3	23	1	8	3	23	6	46	13	36
TOTAL	5	14	6	17	4	11	9	24	12	33	36	

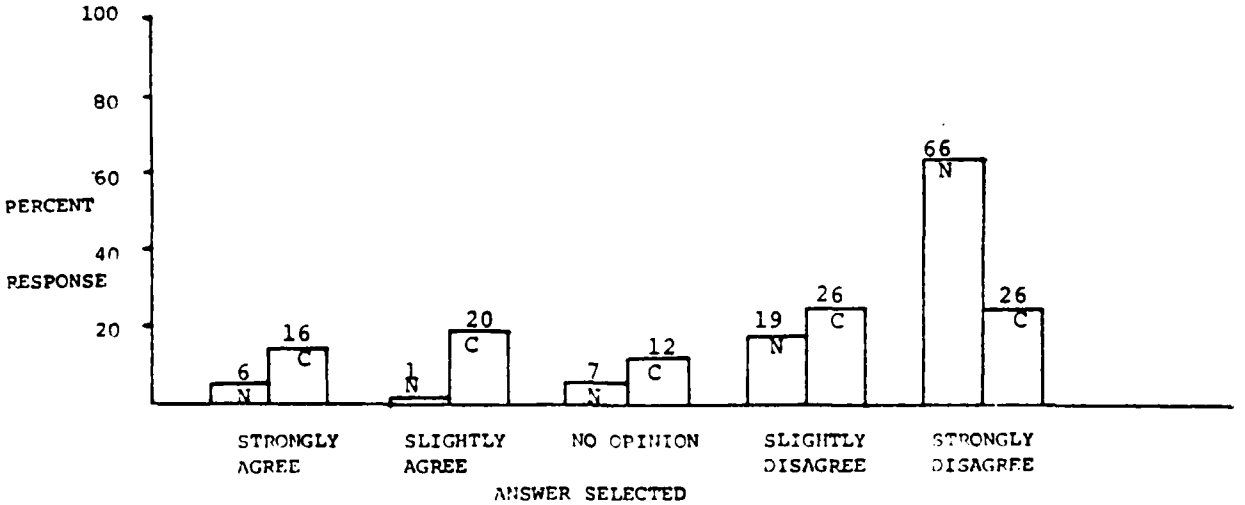


Figure 16. Response to Statement B4m.

20. Section B, Statement 4n - There is less disapproved work or rework on a CQC contract than on a non-CQC contract.

Table XX and Figure 17 show the response to this statement. A majority of Navy respondents (50%) and contractors (59%) disagree; however, the response was mixed within EFD's. CHESDIV and NORTHDIV favored agreement, while LANTDIV, SOUTHDIV, and WESTDIV disagreed. On the contractor side, the majority of all EFD's favored disagreement. There was also a significant response in the "no opinion" category indicating that many respondents possibly consider the amount of rework encountered on the two types of contracts to be about the same. This point is borne out when the weighting is considered since the degree of Navy disagreement remained at fifty percent (50%) while contractor disagreement dropped slightly to fifty-eight percent (58%).

The reason for the Navy response probably stems from the attitude that the contractor, not having a perceived stake in the project other than the profit motive, will not put as much time and effort into quality assurance as a full-time Navy inspector. The perception is therefore that, while the Navy is actively seeking to find and resolve problems before they have an impact on the overall project, the CQC representative will most often not find them until after they have already occurred.

That the CQC program in itself generates additional rework is a debatable issue. The Journal of the Construction

Division of the American Society of Civil Engineers, in reviewing various programs for Quality Control, found that under CQC, as under other programs, unscrupulous or unsophisticated contractors will use the available opportunity not to fulfill specific contract requirements. The greatest problem arises when the Government, in setting up the quality program, includes a complicated, cumbersome system for the implementation of remedial action. If the remedial process is difficult to handle or exceptionally time-consuming, the contractor is encouraged to shortcut the quality process since the Government may elect to accept less-than-specified construction rather than employ the remedy. In order to alleviate this problem, the Government, in manh cases, elects to inspect the contract with the same intensity that a non-CQC contract is inspected, thereby eliminating the cost benefit resulting from reduced inspection effort.

TABLE XX

RESPONSE TO STATEMENT B4n

LESS REWORK ON CQC CONTRACTS THAN NON-CQC

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	0	0	2	20	3	30	5	50	0	0	10	6
NORTHDIV	4	13	8	25	4	13	15	47	1	3	32	20
LANTDIV	17	38	11	24	4	9	9	20	4	9	45	28
SOUTHDIV	11	33	8	28	4	12	7	21	3	9	33	21
WESTDIV	7	19	10	27	5	14	11	30	4	11	37	23
TOTAL	39	25	39	25	20	13	47	30	13	8	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	2	40	2	40	1	20	0	0	0	0	5	14
NORTHDIV	3	43	1	14	1	14	0	0	2	28	7	19
LANTDIV	1	17	2	33	1	17	1	17	1	17	6	17
SOUTHDIV	1	20	4	80	0	0	0	0	0	0	5	14
WESTDIV	3	23	2	15	3	23	4	31	1	8	13	36
TOTAL	10	28	11	31	6	17	5	14	4	11	36	

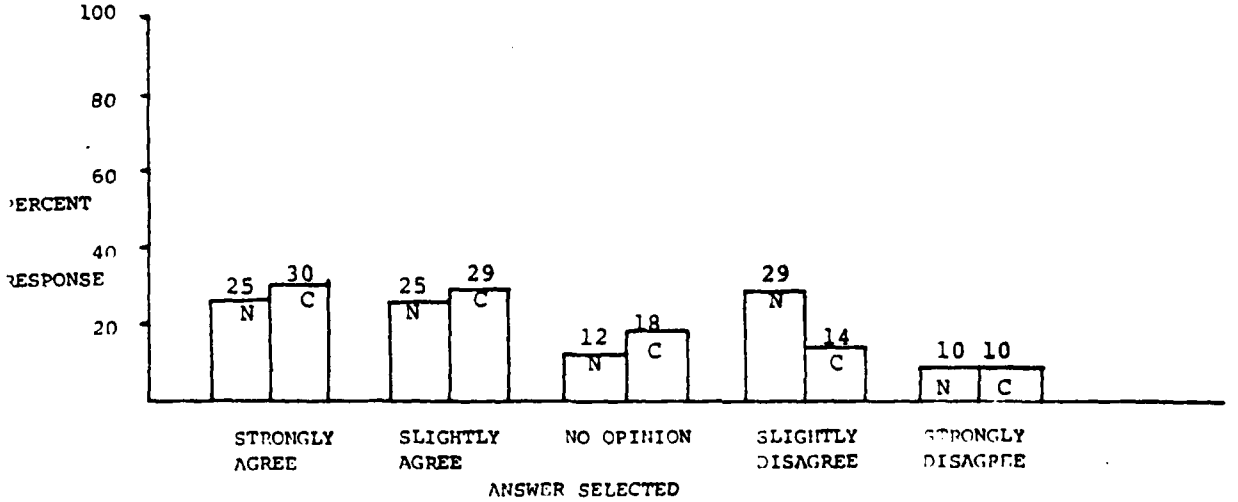


Figure 17. Response to Statement B4n.

21. Section B, Statement 4o - The Navy overinspects CQC contracts.

The Navy disagrees that it overinspects CQC contracts. The strength of this belief is illustrated by the fact that forty percent (40%) of all Navy respondents and five of six EFD high scorers indicated strong disagreement, while in total, sixty-eight percent (68%) of all Navy respondents disagreed. Response was consistent throughout EFD's, and LANTDIV (80%) showed the highest disagreement level.

Contractors also indicated disagreement, but at the lower rate of fifty-two percent (52%). EFD response was mixed for contractors with CHESDIV (80%), LANTDIV (83%), and WESTDIV (54%) disagreeing, and NORTHDIV (56%) and SOUTHDIV (80%) agreeing. Weighting reduced the overall Navy and contractor disagreement to sixty-five percent (65%) and fifty percent (50%) respectively. Table XXI and Figure 18 apply.

Why does the Navy feel that it does not overinspect CQC contracts when in many cases the Navy inspector spends a considerable amount of time observing the work in progress? The reason can probably be found in the difference of the focus of the work. On a non-CQC contract, the Navy inspector must personally hammer out solutions to discrepancies with the contractor's superintendent or foremen; the majority of his time is therefore spent in on-site problem solving. On a CQC contract, the inspector will still identify problems,

but he can now require the CQC representative to list the problem in the daily report. The contractor is then charged with providing the solution from within his own organization. As a result of the CQC process, much on-site inspection time and many construction headaches are avoided by the Navy, but overall, when the review of reports and problem solutions from the contractor are included, the overall amount of inspector time expended on CQC contracts may be about the same.

A conscientious inspector may therefore provide the same amount of time in administering the CQC contract as he does in inspecting a non-CQC contract, and still exact the same quality by manipulating the CQC representative in the correct manner. If, on the other hand, he does not thoroughly familiarize himself with the requirements of the contract, or lets the contractor assume full responsibility for construction quality, problems can certainly arise. Without the presence of the Navy inspector, and the assumed interest in quality that is implied by that presence, quality cannot be assured.

TABLE XXI

RESPONSE TO STATEMENT B4o

NAVY OVERINSPECTION OF CQC CONTRACTS

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	3	30	3	30	1	10	3	30	0	0	10	6
NORTHDIV	14	44	5	16	4	13	5	16	4	13	32	20
LANTDIV	20	44	16	36	4	9	2	4	3	7	45	28
SOUTHDIV	14	42	8	24	2	6	8	24	1	3	33	21
WESTDIV	8	22	13	35	3	8	9	25	4	11	37	23
TOTAL	60	40	45	28	14	9	27	17	12	7	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	3	60	1	20	0	0	1	20	0	0	5	14
NORTHDIV	3	43	0	0	0	0	2	28	2	28	7	19
LANTDIV	0	0	5	83	0	0	1	17	0	0	6	17
SOUTHDIV	0	0	0	0	1	20	1	20	3	60	5	14
WESTDIV	3	23	4	31	1	8	1	8	4	31	13	36
TOTAL	9	24	10	28	2	6	6	17	9	25	36	

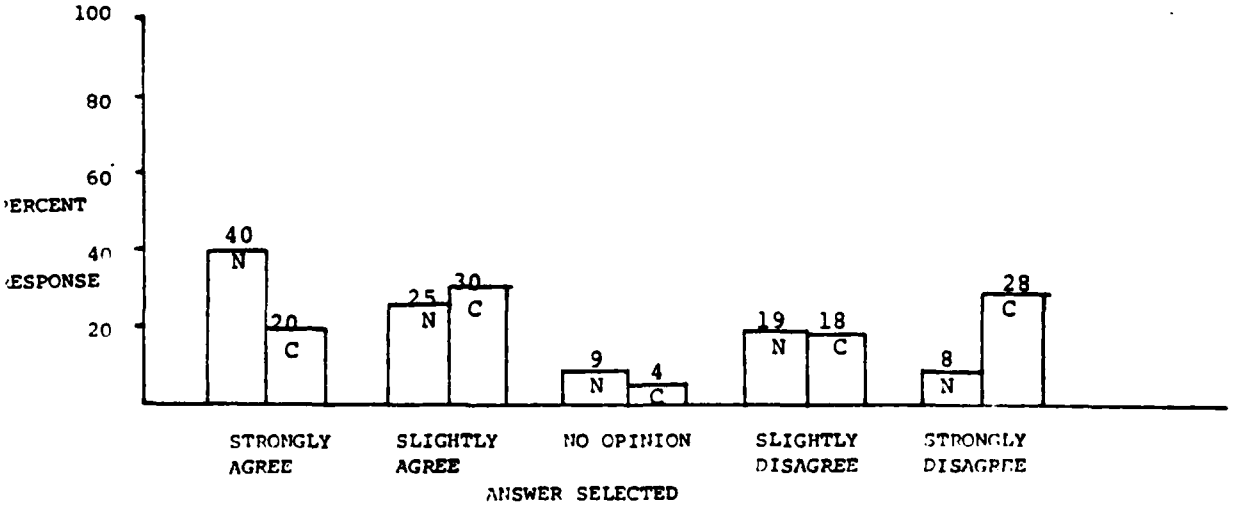


Figure 18. Response to Statement B4o.

22. Section B, Statement 4p - I prefer CQC to non-CQC contracts.

As Table XXII and Figure 19 show, the preference for CQC contracts over non-CQC is mixed. The Navy responded with forty-eight percent (48%) overall disagreement, but a substantial thirty-five percent (35%) as well as four of six high scorers agreed. The "no opinion" category, with a seventeen percent (17%) response, probably indicated the magnitude of the "equal preference" response. Within EFD's, response varied with LANTDIV (54%) SOUTHDIV (61%), and WESTDIV (53%) disagreeing, and CHESDIV (63%) and NORTHDIV (47%) agreeing. Contractors also disagreed, but at a rate of sixty-nine percent (69%), and a similar mixed EFD response. Weighting increased the percentage of disagreement to fifty-one percent (51%) for the Navy, and seventy-two percent (72%) for contractors.

Proponents of the CQC system of insuring construction quality expound the benefits of transferring the liability for quality assurance to the contractor, and also the reduced costs resulting from less inspection time, and the contractor's use of his construction management expertise [Ref. 17]. The fact that these benefits are not readily evident may be the result of the application of CQC on too small a scale. One NORTHDIV Area Coordinator favored CQC, but only on contracts in excess of $10 million dollars, explaining that above this

figure the contractor can fully employ a CQC organization and effect cost savings through economies of scale.

Opponents of CQC cite the continued need for Navy inspection, conflicts between the CQC representative and the project superintendent, and the lack of Navy control over the construction process as major disadvantages. As has been previously pointed out, dissatisfaction with CQC stems, not from the use of the contractor as an instrument for quality control, but rather in the methods used to effect the quality. Procedures, and not the basic philosophy, have therefore apparently held back acceptance of the CQC program.

TABLE XXII

RESPONSE TO STATEMENT B4p — PREFERENCE FOR CQC OVER NON-CQC CONTRACTS

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	9	1	9	2	18	4	36	3	27	11	7
NORTHDIV	6	19	4	13	7	22	8	25	7	22	32	20
LANTDIV	17	38	7	16	8	18	9	20	4	9	45	28
SOUTHDIV	17	52	3	9	6	18	3	9	4	12	33	21
WESTDIV	10	26	11	29	4	11	5	13	8	21	38	24
TOTAL	51	32	26	16	27	17	29	18	27	17	160	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	1	20	0	0	0	0	0	0	5	14
NORTHDIV	4	57	0	0	1	14	1	14	1	14	7	19
LANTDIV	2	33	1	17	0	0	3	50	0	0	6	17
SOUTHDIV	3	60	1	20	0	0	0	0	1	20	5	14
WESTDIV	8	62	1	8	1	8	3	23	0	0	13	36
TOTAL	21	58	4	11	2	6	7	19	2	6	36	

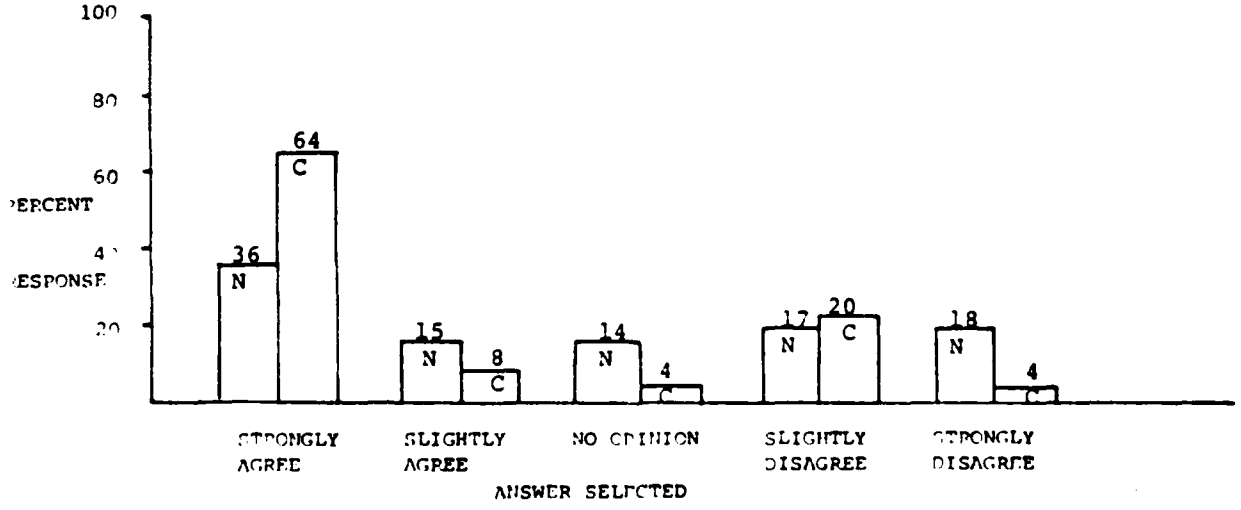


Figure 19. Response to Statement B4p.

23. Section B, Statement 4q - In general, costs are reduced under CQC.

The general opinion of respondents was to disagree that costs are reduced under CQC contracting. Sixty-nine percent (69%) of the Navy response, including four of five EFD high scorers, disagreed. NAVFAC strongly agreed. Among EFD's response was consistent except that CHESDIV disagreed only at a rate of thirty percent (30%).

Contractor disagreement was stronger still with an eighty percent (80%) disagreement level. All contractor response within EFD's favored disagreement. Weighting reduced Navy disagreement to sixty percent (60%), but raised contractor disagreement to eighty-two percent (82%). Table XXIII and Figure 20 apply. It would appear, therefore, that neither the Navy nor the contractors perceive that CQC reduces costs, despite cost savings being one of the touted benefits.

CQC should theoretically provide a double cost savings. The Government should benefit from a reduction in inspection effort, and also from an increase in the quality of the contractor's bidding on large Government jobs. The contractor's cost savings should result from his use of good management techniques, and the ability to drop bid contingencies since the CQC program should be identically managed throughout the owner organization.

The October 1978 issue of Industrial Engineer noted that Allis-Chalmers Corporation had made an additional $75

dollars in earnings that could be directly related to quality assurance measures. It is savings of this sort that the Navy had in mind when the CQC program was implemented: savings that are perceived not to have materialized [Ref. 18].

One reason cited by several Navy respondents for the lack of financial success of the CQC process is the status of the CQC representative. The program, in order to be successful, should produce a CQC representative with the best possible construction and management skills. In order to cut costs, contractors will usually submit for approval an individual with the minimum skill level the Navy will accept. This practice seriously dilutes the potential of CQC, and results in no construction cost savings for the contractor. This same practice also reduces the cost savings for the Navy since a less competent CQC representative will induce a greater amount of on-site Navy inspection.

Contractors in general cited one main reason for this lack of cost savings. Under CQC, the contractor is required to review and approve shop drawings and submittals, yet the Navy and the designer also provide the same review. By duplicating the review process, the anticipated time and cost savings to the contractor resulting from his approval of submittals has not materialized.

The only positive comment from a contractor relating to cost savings came from a NORTHDIV construction company president who stated that the major benefit of CQC, on large

jobs, is that the contractor, by controlling his effort, may be able to reduce construction time by ten to thirty percent. Whether CQC reduces construction time on large projects was not the subject of this research, however, and no other respondent noted time savings as a real effect of the CQC program.

TABLE XXIII

RESPONSE TO STATEMENT B4q — CQC COST REDUCTION

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	0		0		0		0		1		1	1
CHESDIV	1	10	2	20	5	50	2	20	0	0	10	6
NORTHDIV	11	34	8	25	9	28	4	13	0	0	32	21
LANTDIV	26	58	11	24	1	2	5	11	2	4	45	29
SOUTHDIV	19	59	8	25	3	9	1	3	1	3	32	21
WESTDIV	15	42	7	19	7	19	2	6	5	14	36	23
TOTAL	72	46	36	23	25	16	14	9	9	6	156	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	4	80	0	0	0	0	1	20	0	0	5	14
NORTHDIV	4	57	1	14	1	14	0	0	1	14	7	19
LANTDIV	2	33	3	50	0	0	1	17	0	0	6	17
SOUTHDIV	4	80	1	20	0	0	0	0	0	0	5	14
WESTDIV	8	62	2	15	1	8	2	15	0	0	13	36
TOTAL	22	61	7	19	2	6	4	11	1	3	36	

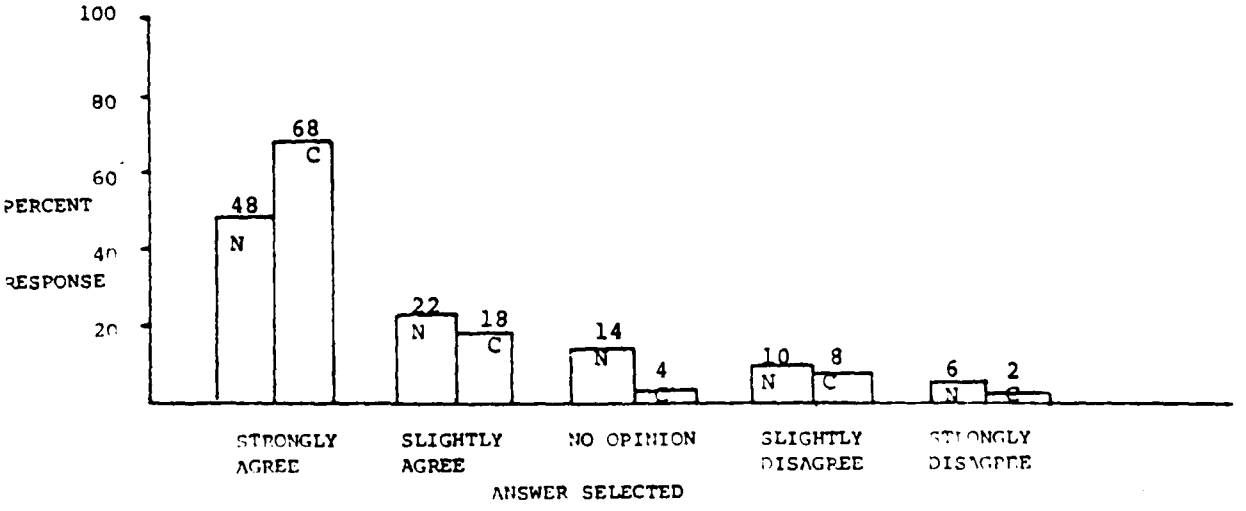


Figure 20. Response to Statement B4q.

24. Section B, Statement 4r - The contractor would hire the CQC individual in a similar function under non-CQC conditions.

Table XXIV and Figure 21 show the response to this statement. In general, Navy respondents strongly disagreed that the contractor would provide his own CQC representative if the Navy did not require one. Fifty-seven percent (57%) of Navy respondents, and four of five EFD high scorers answered in the "strongly disagree" category. In total, seventy-six percent (76%) of the Navy respondents disagreed, CHESDIV being the only EFD not to disagree.

Contractors also disagreed strongly, with a fifty-three percent (53%) response in that category and a seventy-seven percent (77%) total disagreement. Of contractor response within EFD's, only LANTDIV did not follow the majority. Weighting slightly reduced Navy disagreement to seventy-five percent (75%) and increased contractor disagreement to eighty percent (80%).

By relating this response to the earlier conclusion that the contractor is not perceived to be willing to provide adequate quality control unless forced to do so, it is apparent that, without the CQC provision, the only party directly concerned with quality would be the Navy by its vested interest.

But perhaps this perception is not necessarily correct. One contractor suggested that, even without the CQC

representative, most contractors would still provide a quality finished product. The reason for this assertion was that since most customer organizations do not now require a formal CQC program but do require quality construction, the standard contractor organization is set up to ensure quality on the production level. The contractor, therefore, does indeed emphasize quality, but not on the formal scale required by the CQC program, and while the CQC representative would not be retained under non-CQC conditions, the CQC function would still exist in the operating forces.

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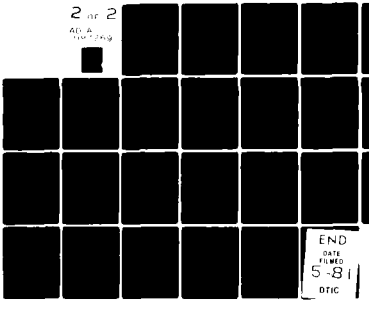

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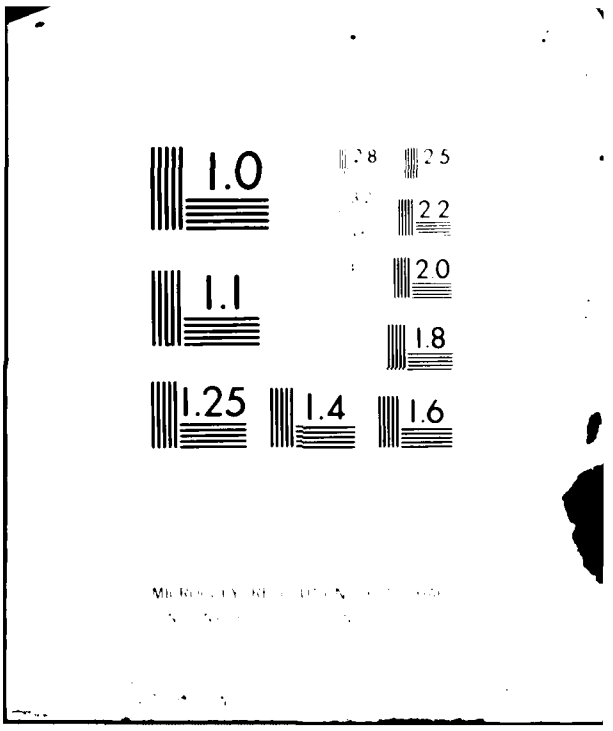
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TABLE XXIV

RESPONSE TO STATEMENT B4r

CONTRACTOR USE OF CQC INDIVIDUAL UNDER NON-CQC CONDITIONS

NAVY RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
NAVFAC	1		0		0		0		0		1	1
CHESDIV	3	30	2	20	1	10	4	40	0	0	10	
NORTHDIV	23	70	5	15	2	6	2	6	1	3	33	
LANTDIV	23	51	8	18	5	11	6	13	3	7	45	
SOUTHDIV	15	47	6	19	4	13	6	19	1	3	32	
WESTDIV	25	68	9	24	1	3	1	3	1	3	37	
TOTAL	90	57	30	19	13	8	19	12	6	4	158	

CONTRACTOR RESPONSE

	ANSWER SELECTED											
	STRONGLY AGREE		SLIGHTLY AGREE		NO OPINION		SLIGHTLY DISAGREE		STRONGLY DISAGREE		TOTAL	
ACTIVITY	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% EFD	NUMBER RESP.	% TOTAL
CHESDIV	3	60	2	40	0	0	0	0	0	0	5	
NORTHDIV	2	25	2	25	1	13	1	13	1	13	8	
LANTDIV	3	50	0	0	0	0	3	50	0	0	6	
SOUTHDIV	3	60	2	40	0	0	0	0	0	0	5	
WESTDIV	8	62	3	23	0	0	1	8	1	8	13	
TOTAL	19	53	9	24	1	3	5	14	2	6	36	

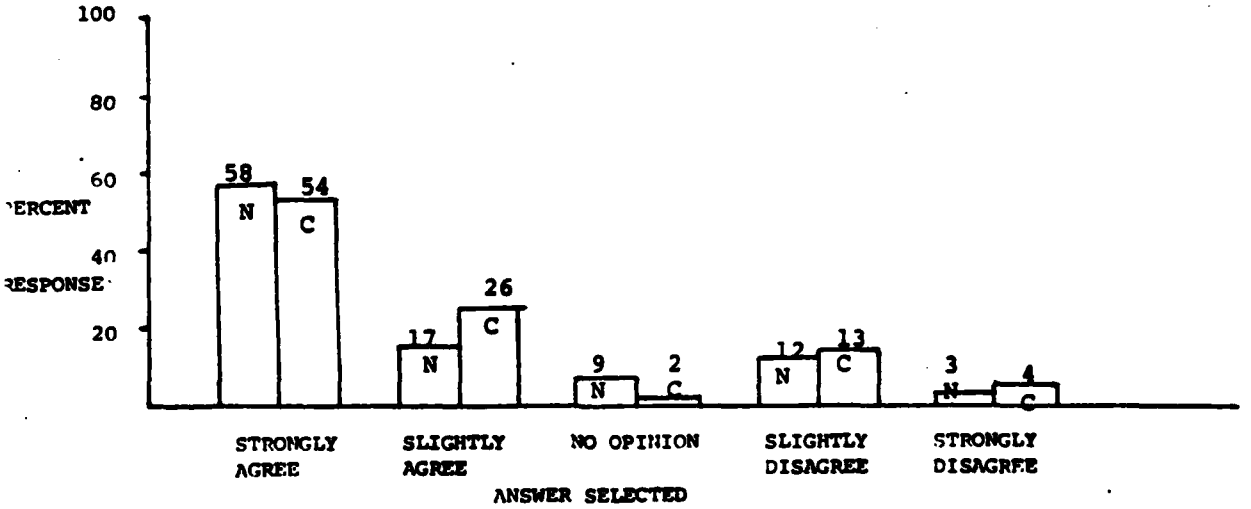

Figure 21. Response to Statement B4r.

25. Section C, Question 1 - What are the approximate pay scales of a CQC representative in the ranges: less than $1 million, $1 million to $5 million, and greater than $5 million?

Tables XXV and XXVI display the response to this question from Navy and contractor respondents. The purpose of the question was to compare what the Navy and the contractors perceive the monthly salary of the CQC representative to be.

It is easily seen, from a comparison of the tables, that in general the Navy perceived the salary of the CQC representative to be less than the contractors actually paid. On contracts less than $1 million, the Navy average answer was $1530 per month while the contractor indicated $1625 per month; on contracts in the ranges from $1 million to $5 million the Navy average answer was $1693 per month compared to the contractor's $1910 per month; and on contracts greater than $5 million the Navy answered $2063 per month and the contractor $2114 per month.

The reason for the Navy's underestimation of CQC salary may lie in the fact that, in general, Navy response to the attitude portion of the survey indicated a definite belief that CQC does not fulfill its purpose. By responding in ranges less than the actual amount paid, the Navy may have voiced an opinion on the worth of the CQC representative and not on his value.

TABLE XXV

NAVY RESPONSE TO CQC REPRESENTATIVE SALARY RANGES

ACTIVITY	NO. RESP.	HIGH ANSWER	LOW ANSWER	AVG. ANSWER
Contracts Less than $1 Million				
NAVFAC	0	0	0	0
CHESDIV	1	0	0	1500
NORTHDIV	16	2800	1000	1458
LANTDIV	18	2000	800	1455
SOUTHDIV	10	1800	800	1370
WESTDIV	14	3000	1000	1824
TOTAL	59			1530
Contracts from $1 Million to $5 Million				
NAVFAC	1	0	0	1667
CHESDIV	4	2083	1700	1896
NORTHDIV	22	2800	1000	1587
LANTDIV	27	2500	1000	1648
SOUTHDIV	27	2200	1000	1548
WESTDIV	23	3500	1000	2315
TOTAL	104			1693
Contracts Greater than $5 Million				
NAVFAC	1	0	0	2083
CHESDIV	3	2000	1700	1900
NORTHDIV	19	2800	1200	1601
LANTDIV	18	3500	1000	2260
SOUTHDIV	26	3000	1000	1924
WESTDIV	22	4000	1200	2486
TOTAL	89			2063

TABLE XXVI

CONTRACTOR RESPONSE TO CQC REPRESENTATIVE SALARY RANGES

ACTIVITY	NO. RESP.	HIGH ANSWER	LOW ANSWER	AVG. ANSWER
Contracts Less than $1 Million				
CHESDIV	3	2400	1200	1633
NORTHDIV	4	2000	1100	1425
LANTDIV	2	3000	1800	2400
SOUTHDIV	3	1500	1200	1400
WESTDIV	4	2200	1100	1600
TOTAL	16			1625
Contracts from $1 Million to $5 Million				
CHESDIV	3	2700	2000	2333
NORTHDIV	6	2000	1100	1457
LANTDIV	5	3000	1200	2100
SOUTHDIV	5	2500	1680	1756
WESTDIV	9	2700	1400	2050
TOTAL	28			1910
Contracts Greater than $5 Million				
CHESDIV	2	3000	2000	2500
NORTHDIV	3	2000	1200	1500
LANTDIV	3	3000	1600	2300
SOUTHDIV	3	2000	1200	1633
WESTDIV	10	3000	1500	2310
TOTAL	21			2114

26. Section C, Question 2 - What are the approximate pay scales of a Navy construction representative assigned to inspect construction in the ranges less than $1 million, $1 million to $5 million, and greater than $5 million?

Table XXVII displays the Navy response to this question. Insufficient contractor response was received to develop a contractor-response table; the most common reason cited for the lack of contractor response was the non-availability of information. It is interesting to note that while a great many Navy respondents estimated the salary of the CQC representative, very few contractors estimated the Navy inspector's salary. No comparison of Navy and contractor perceptions could therefore be made.

Despite the lack of comparative information in this response, it was still possible to compare the Navy's answers to this question with those of the preceding question. In every case, the average Navy inspector salary was less than the average perceived CQC representative salary, which in turn was less than the contractor's actual CQC salary. The reason for this difference may be that, in the opinion of most Navy personnel, the typical inspector, like other civil servants, is not paid commensurate with the difficulty of the work for which he is responsible. The CQC representative, who has much less perceived responsibility-than the Navy inspector, reaps the benefits of the contractor's profits.

The perception existed, therefore, that no matter how little the CQC representative is paid, and how little he accomplishes, the Navy inspector is paid less.

TABLE XXVII

NAVY RESPONSE TO NAVY CONSTRUCTION REPRESENTATIVE SALARY

ACTIVITY	NO. RESP.	HIGH ANSWER	LOW ANSWER	AVG. ANSWER
Contracts Less than $1 Million				
NAVFAC	0	0	0	0
CHESDIV	7	2000	1500	1750
NORTHDIV	24	1800	800	1489
LANTDIV	24	1800	975	1561
SOUTHDIV	25	1800	1000	1367
WESTDIV	25	2000	1200	1568
TOTAL	105			1512
Contracts from $1 to $5 Million				
NAVFAC	1	0	0	1666
CHESDIV	8	2000	1500	1729
NORTHDIV	25	1800	1000	1570
LANTDIV	28	1800	975	1524
SOUTHDIV	30	2000	1020	1557
WESTDIV	28	2000	1250	1718
TOTAL	120			1602
Contracts Greater than $5 Million				
NAVFAC	1	0	0	1666
CHESDIV	7	2000	1500	1779
NORTHDIV	25	1900	1200	1560
LANTDIV	24	2000	975	1465
SOUTHDIV	30	2000	1000	1750
WESTDIV	29	2500	1400	1533
TOTAL	116			1597

27. Section C, Question 3 - What are the approximate costs of administering a CQC contract?

Response to this question is shown in Table XXVIII, since the number of Navy and contractor responses to this question was small, no breakdown of EFD results is provided.

TABLE XXVIII

ADMINISTRATIVE COSTS OF CQC CONTRACTING

CATEGORY	NO. RESP.	HIGH ANSWER	LOW ANSWER	AVG. ANSWER
Navy	40	$6300/mo.	$150/mo.	$2063/mo.
Contractors	27	$9000/mo.	$250/mo.	$3176/mo.

28. Section C, Question 4 - What are the approximate costs of administering a non-CQC contract?

Table XXIX displays the response to this question. No EFD breakdown was provided. The average response of the Navy and contractors was very close, differing by approximately $70 per month. It is in the comparison of Tables XXVIII and XXIX that an interesting development occurred. Both Navy and contractors agreed that a non-CQC contract can be administered for less than a CQC contract. If the CQC program were functioning properly, however, the costs of administration should be less for CQC from both the Navy's and contractor's perspectives since the Navy will not have to provide total inspection, and since the contractor, by performing his own quality control, will avoid many construction problems and delays. The perception, therefore, is that CQC does not save administration costs from either the Navy's or contractor's points of view.

Another interesting aspect of this question uncovered by the survey is shown by comparing the difference in the averages of the contractor's answers for the administration of CQC and non-CQC contracts ($1836 per month) with the average of the CQC salary obtained from Table XXVI ($1883); the two numbers are almost exactly the same. The conclusion could be drawn that the only additional aspect of Quality Control performed by the contractor under CQC is the provision

of the CQC representative. No additional administrative costs are identified.

TABLE XXIX

ADMINISTRATION COSTS OF NON-CQC CONTRACTING

CATEGORY	NO. RESP.	HIGH ANSWER	LOW ANSWER	AVG. ANSWER
Navy	41	$8000/mo.	$100/mo.	$1414/mo.
Contractors	16	$4500/mo.	$100/mo.	$1340/mo.

29. Section C, Question 5 - Does the IRS or other Government agencies audit CQC contracts more often than non-CQC ones?

Table XXX shows the results of the response to this question. The majority of the Navy respondents (83%) and the contractors (96%) believed that the CQC provision does not result in a greater frequency of auditing by any Government agency.

TABLE XXX

AUDITING BY GOVERNMENT AGENCIES

CATEGORY	NUMBER "YES" RESP.	% CAT.	NUMBER "NO" RESP.	% CAT.	TOTAL RESP.	% TOTAL
Navy	11	17	55	83	66	73
Contractors	1	4	24	96	25	27
Total	12	13	79	87	91	

30. Section C, Question 6 - How much would a typical bid price be reduced or increased if the CQC provision were eliminated?

Tables XXXI and XXXII show the Navy and contractor response to this question. Eighty-five percent (85%) of the Navy respondents, and one hundred percent (100%) of the contractors who provided answers in dollars agreed that, without CQC, bid price would be reduced. Of those respondents who provided answers in units other than dollars, twenty-seven of twenty-nine Navy respondents, and seventeen of nineteen contractors indicated a bid price reduction. Interestingly, NAVFAC responded that no price reduction would occur.

TABLE XXXI

NAVY BID PRICE CHANGE ESTIMATE

CATEGORY	NO. RESP.	% TOTAL	HIGH SELECTION	LOW SELECTION	AVERAGE SELECTION
Bid reduction	35	85	$85,000	$5,000	$32,229
Bid increase	6	15	$50,000	$23,000	$30,000
Total	41				

TABLE XXXII

CONTRACTOR BID PRICE CHANGE ESTIMATE

CATEGORY	NO. RESP.	% TOTAL	HIGH SELECTION	LOW SELECTION	AVERAGE SELECTION
Bid reduction	10	100	$120,000	$3,500	$61,550
Bid increase	0	--	--	--	--
Total	10				

31. Section C, Item 7 - Please include any comments or questions that you feel are essential to this research or that are missing from this survey.

One of the most interesting aspects of this survey was the degree of response encountered, not only in the high percentage of questionnaire returns, but also in the surprising response to this particular portion of the questionnaire. Fifty-six percent (56%) of all Navy respondents and fifty-three percent (53%) of all contractor respondents included comments in this segment of the questionnaire. These comments ranged from a single sentence in some instances to full additional pages of opinions in others. To reproduce the comments received would nearly double the content of this section. Instead, written statements or opinions were divided into three specific groups, each dealt with in a different manner

The first group, comments regarding specific issues raised in other parts of the questionnaire, were used to develop the analysis of respondent attitudes and opinions. The second group, suggestions for improving or revising the CQC process, are discussed in the following section of this chapter. The third, general comments on the present status of CQC, while offering little value technically, framed the atmosphere under which the responses were given, and are included herein. The following are a selectional cross-section of comments made in the third category.

SOURCE	COMMENT
CHESDIV AROICC	Generally the added costs involved with CQC outweigh the benefits, which are slight.
NORTHDIV AREA COORDINATOR	CQC is the best alternative we have to the problem of insufficient Government inspectors due to ceilings, and is much cheaper than Title II. If you get a good CQC plan and make the contractor follow it, you will get good quality. A record of removal of problem CQC representatives helps establish credibility in Navy enforcement.
NORTHDIV SUPERVISORY CIVIL ENGINEER	The only beneficial factor of the CQC program is that the contractor remains liable for his work, including faulty work due to workmanship, materials, or wrongly approved shop drawings irregardless of when the error was discovered.
NORTHDIV CONSTRUCTION REPRESENTATIVE	If the Navy would enforce the specs on CQC it would work great.
EFD BRANCH HEAD	As long as the Navy and other Government agencies select contractors on the basis of low bidder, a self-inspection system by the contractor (CQC) will never work.
LANTDIV CIVILIAN AROICC	The single advantage of CQC is that anything missed during inspection can be blamed on the CQC representative and not the Government inspector. But a contractor is supposed to be ultimately responsible for his work anyway.
LANTDIV CONSTRUCTION REPRESENTATIVE	Whenever I've encountered a really efficient, conscientious individual serving as CQC, he has sought other employment either for reasons of conscience or salary.

SOUTHDIV AREA COORDINATOR - CQC can be a mixed bag. The contractor who wants to make a mockery of it can usually find a way; however, most take it fairly seriously, and in those cases, I feel it is worth the price I'm sure we pay for it.

SOUTHDIV ROICC - We must continually remind the CQC representatives of their responsibilities. I'm sure lots of items slip by because of the CQC concept.

SOUTHDIV SUPERVISORY CONSTRUCTION REPRESENTATIVE - The Government inspector does not feel fully responsible for CQC contracts, therefore, he does not spend the time to study the contract requirements in detail and may not be present at crucial times.

SOUTHDIV AROICC - A properly administered CQC contract can be a great asset to both the contractor and the Navy. There is no reason why a contractor will not attempt to complete high quality work if he knows there is an ultimate benefit to him.

SOUTHDIV ROICC - (The money saved on bid price) could be better spent on Navy inspection of contractor work. CQC with its inherent conflict of interest does not work as intended. Good contractors will do good work with or without CQC.

WESTDIV AROICC - Although I support the idea of a CQC program, we have had rather mixed results with the system and it is difficult to say whether CQC projects turn out better than non-CQC. The overall success of a project depends heavily on the quality of the design; the contractor and Government personnel involved, and other external factors really have nothing to do with the CQC program per se.

WESTDIV CONSTRUCTION REPRESENTATIVE - We do not give the CQC man the backing he needs for him to do his job. Too often he is threatened by the contractor with firing if he does not agree with the project superintendent. He should be protected from harassment.

WESTDIV ROICC - We could double our staff and eliminate CQC with ease.

CHESDIV CQC REPRESENTATIVE - I feel CQC contracts should be eliminated for several reasons. The money could be better spent hiring more Navy inspectors to a short-handed staff and get a better finished product.

CHESDIV PROJECT MANAGER - Although our people are trained to be quality oriented, we have found that many contract requirements regarding quality and finish can be interpreted in various ways. If the owner is not represented at the site, significant additional costs could be encountered to redo work within contract limits or the owner may have to live with a product he doesn't really want.

NORTHDIV CONTRACTOR - The CQC's authority and control, intended to be complete, is overruled and usurped by the Navy, rendering the system wasteful and ineffective.

NORTHDIV PROJECT MANAGER - The CQC position is used by the Navy representatives as a party to blame for all problems arising on the job site, and as a way to avoid involvement in any decision making.

LANTDIV CONSTRUCTION SUPERINTENDENT - The CQC representative is generally experienced in one area of work, whereas the Navy has various people experienced in their respective trades, available as needed for quality control.

SOUTHDIV PROJECT MANAGER - Having been a CQC, I was personally benefitted very much; however, I don't feel that there is anything I did for the job that wouldn't have been done anyway.

WESTDIV CQC REPRESENTATIVE - The CQC program as set up, directly adds to the contractor's costs. Quality control is a must for all reputable contractors. It is done with the production forces. The CQC program introduces an additional monitoring force that also is monitored by the Navy and the designer. The intermediate step is ineffective, as the real power to make changes where required and to see that proper interpretations of the specifications are made, must stay with the designer and the owner.

C. ALTERNATIVE QUALITY PROGRAMS

No discussion of the CQC program could be complete without an examination of alternate methods of Quality Control. However, rather than a broad examination of the wide range of available Quality Control techniques, some of which would be costly for the Navy to implement or impractical to enforce, this discussion will be limited to less esoteric variations on the present CQC theme.

Response to the survey questionnaire indicated that a large portion of respondents were not satisfied with the results of the Navy's CQC program. Simultaneously, however, many of the written responses indicated that the fault was not in the CQC concept, but rather in the format of its presentation. The theme of this section will therefore be not how to replace CQC, but how to improve it.

There were many suggestions from respondents on methods to modify the CQC program in order to achieve better results. Most of these suggestions were made in one of two categories: suggestions for procedural or administrative changes, or suggestions for changes in the philosophy of CQC. It is in these two categories that the alternatives will be presented.

1. Internal/Administrative CQC Alternatives

a. Prominent Display of the CQC Requirement

Several contractors objected that, since the CQC requirements were detailed in the contract General Provisions and not in the Specifications, there was a tendency on the part of many contractors to discount the importance of CQC. A more-prominent entry in the beginning of the specifications could alert the contractor that CQC will be used and enforced in its entirety, and Section 76 of the General Provisions could be attached to the bid package.

b. More-Detailed Screening of the CQC Candidate

Many Navy respondents suggested that a great deal of trouble could be saved if the Navy would screen the CQC nominees more closely and turn down candidates without sufficient qualifications or experience. By putting the contractor on notice that second-rate CQC personnel are not acceptable, the Navy could convince the contractor of the seriousness of its intentions.

c. Educate the ROICC

The response to many of the questions of the questionnaire indicated that many Navy personnel are not aware of the limits of constructive action that could be taken to make the CQC program work. EFD training sessions, where ROICC personnel could learn CQC skills and share experiences would broaden the education of the contract administrator and also promote more unified practical application of CQC techniques.

d. Educate the Contractor

Another proposed method of improving the CQC program was to convince the contractor that CQC would save him money if properly administered. Many contractors sincerely believe that the Navy instituted CQC for the sole purpose of ensnaring the contractor in a web of paperwork. An easy-to-understand booklet detailing the CQC process, explaining its benefits, and even showing examples of practical application of good CQC techniques could be published and distributed to present and potential CQC contractors. This booklet could, in the long run, change many contractor attitudes toward CQC.

e. Better Define the CQC Program

It was suggested that since many of the aspects of CQC are objective in nature, interpretation disagreements are inevitable. A comprehensive review of CQC with the goal of establishing definite standards for quality should

be accomplished. The more specific CQC is made, the fewer the interpretive claims.

f. Let the Superintendent be the CQC

Many contractors argued that they had CQC in effect without the CQC provision, but that it was included in the duties of the production forces. One contractor claimed that the Corps of Engineers allows the superintendent to function as the CQC on selected contracts. Letting the production function control quality could work if the contractor were totally serious about providing quality construction.

g. More Effective Design Review

Another tool available to the Navy that could have a significant impact on the results of the CQC program is the design review. The design review has been called by some to be the most important tool for developing inherent quality or reliability in a product [Ref. 19].

By setting standards for design quality and thoroughly reviewing all aspects of the plans and specifications, it is possible to eliminate many potential problems before the contract is let. To do this correctly, the Navy would be required to invest a considerable amount of its EFD talent into the formation and operation of design review teams. These teams, composed of experts in each aspect of the project, would review the potential contract in far more depth and detail than is presently being accomplished. A review conducted in this manner would not only clear up design problems

before they became construction problems, but would also alert the designers that the Navy is interested in complete, quality designs.

2. External/Philosophical CQC Alternatives

a. Separate CQC from the Contractor

A great many Navy and contractor proposals called for the total separation of the CQC function from the contractor, thereby eliminating any potential or actual conflict of interest. Several methods were suggested for accomplishing this segregation. The ROICC, not the contractor, could hire the CQC representative, salaried by the contractor or by the cost savings resulting from the elimination of the CQC from the contractor's responsibilities. The contractor could hire the CQC representative, but abdicate the privilege of firing him or reducing his pay unless sufficient evidence existed to document his deficiencies. The CQC representative could also be hired by the Navy separate from both the contractor and the ROICC, as an independent Quality Control expert.

b. Hire Another Agency as CQC

The CQC function could be contracted with an independent agency or consulting firm. This firm could provide Quality Control inspection on one or several jobs simultaneously. The advantages of this system would be consistent quality standards as well as the cost savings resulting from economies of scale if one contract were awarded for CQC on several construction projects.

c. Increase Designer Responsibility

The largest single response in this category favored the designer taking an increased role in the construction process, including the CQC function. There are many reasons why the designer is a logical choice to practice CQC; primary among them is the fact that, of all parties in the contract process, the designer has the best grasp of the requirements of the customer and the intentions of the plans and specifications.

To illustrate the incongruity of the present system of designer involvement, it is only necessary to review the Comptroller General's review, in July of 1977, of the policy establishing designer responsibility for design deficiencies. The report found that Government agencies were ignoring the designer after the contract had been awarded, even to the point of not pursuing the collection of additional costs resulting from design errors and omissions.

Although the designer, with his knowledge of the Navy's desires and the design criterion would seem a likely candidate to provide Quality Control, there are several problems inherent to this change. The first is the fact that the American Institute of Architects (AIA), through its standards, limit the designer's role in construction inspection, prohibiting exhaustive, or continuous on-site inspection. The second factor is the fact that the designer, if knowing that he will have control of job quality, may not sufficiently

design the project before it is bid [Ref. 17]. By employing the designer as the CQC force, the Navy may therefore end up with more problems than are presently encountered.

IV. SUMMARY

Table XXXIII provides a condensation of the data displayed in Chapter III. The Navy and contractor response to each particular statement is denoted by either an "A" or a "D" depending on whether the majority response approved or disapproved of the premise presented.

In addition to the majority response information, there are three other features incorporated into Table XXXIII to allow for easier analysis of the data. First, the response columns, in addition to the Navy and contractor majority response, also include a third column titled "Model." This column reflects the anticipated view of the majority of CQC participants in the situation where the CQC program was functionally ideal. Evaluations in the Model column were compared to those in the Navy and contractor columns to see how well each agrees with the perfect case.

Second, five of the statements are marked by a double asterisk (**). These five statements, assessing the attitudes of respondents to CQC interface, delays, finished product, rework, and the preference for CQC construction, relate most directly to the respondent's overall view of the success of the CQC program, and have therefore been termed the "key" statements of the questionnaire. Navy, contractor, and model response on each of the key statements was compared.

Finally, there are three statements that measure the respondent's view of the contractor's integrity and talent. These statements are noted by an asterisk (*), and a comparison of Navy, contractor, and model response on these contractor skill statements was also performed.

The model answers agreed with the Navy response in only seven (7) of twenty-one (21) cases (33%). The model and the contractor agreed eight times (38%). In only five cases, (24%) did all three agree. Interestingly, the Navy and contractor responses matched in sixteen (16) instances (76%).

Unanimous majority agreement existed on the statements that the Navy should perform final inspections, that CQC contracts do not experience more delays than non-CQC, that the CQC plan is vital, and that Navy personnel understand and do not overinspect CQC. Of the areas where agreement was consensus, only the delay statement was designated as a key issue.

Comparing the overall response on the key issues, it was noted that while all three parties agreed on delays, Navy and contractor response was identical on every other key issue. This agreement indicates general opinion, contrary to the model, that CQC does not provide a smooth Navy-contractor interface, that CQC does not provide a better finished product than non-CQC, that CQC contracts do not experience less rework than non-CQC, and that most respondents do not prefer CQC to non-CQC contracts.

Navy and contractor responses on the three contractor integrity statements were contradictory. Both contractors and the model indicated that most contractors would provide quality without the CQC program, that the CQC representative is usually sufficiently qualified, and that the contractor gives the CQC representative free rein in performing his duties. Navy respondents exhibited disagreement with each of these responses.

Another interesting aspect of the summary is the fact that there were eleven (11) instances (50%) where the Navy and contractor response matched in disagreement with the model. In addition to the key statements previously discussed, this agreement indicated that the Navy should be responsible for compliance and progress inspection, that CQC has an inherent conflict of interest, that CQC contracts are not better designed than non-CQC, that the qualifications of the CQC representative should be spelled out more clearly, that CQC does not reduce costs, and that the contractor would not hire the CQC representative in a similar function if not required to do so.

Considering the individual and summary response as a whole, it is obvious that the Navy's CQC program has much room for improvement. This view is demonstrated by the facts that the response from the majority of Navy and contractor personnel were contrary to the model in most instances, that the majority of respondents indicated a preference for non-CQC

contracting, and that response to many statements included in both this research and the previous Dean survey indicated a decline in the attitudes of respondents in general.

While the data appear on the surface to indict the CQC program, this is not necessarily the case. A great many public and private sources support the CQC concept, and as has been shown previously, the general comments of many respondents indicated that while there is dissatisfaction with various specific aspects of the CQC program, the concept on the whole is acceptable and even inevitable.

The Navy's future CQC role, therefore, should be one of enlightenment and affirmative action. Enlightenment is essential since nothing is worse for the morale of a field office employee or contractor than to find that problems encountered on the lowest levels have been avoided or solved successfully in other areas, and the techniques and information concerning that success has not been circulated. Affirmative action is necessary since any program that is important and involves great numbers of people should not be considered or treated to be static. Gradual, well-conceived, change should be an integral part of the program's life cycle if it is to function at peak efficiency.

The respondents to the questionnaire, through their responses, have indicated displeasure with the Navy's CQC program. It is the task of the program managers in NAVFAC and the EFD's to evaluate the situation and to make an effort to improve it.

TABLE XXXIII

COMPARISON OF THE MAJORITY RESPONSE OF NAVY AND CONTRACTORS

Statement Number	Statement Summary	Majority Response Navy	Contractor	Model
B1	Responsibility for Compliance Inspection	N	N	C
B2	Responsibility for Progress Inspection	N	N	C
B3	Responsibility for Final Inspection	N	N	N
B4a(*)	Contractor would provide CQC without CQC Program	D	A	A
B4b(**)	CQC Provides Smooth Interface	D	D	A
B4c	CQC Reduces Submittal Time	A	D	A
B4d	CQC Provides Flexibility	A	D	A
B4e(**)	CQC Experiences More Delays than Non-CQC	D	D	D
B4f(**)	CQC Provides Better Finished Product than Non-CQC	D	D	A
B4g	CQC has an Inherent Conflict of Interest	A	A	D
B4h(*)	CQC Representatives Usually Qualified	D	A	A
B4i	CQC Better Designed than Non-CQC	D	D	A
B4j(*)	Contractor Gives Free Rein to CQC Representative	D	A	A
B4k	CQC Plan is Vital	A	A	A
B4l	Navy Personnel Understand CQC	A	A	A
B4m	Qualifications of CQC Representative Needed	A	A	D
B4n(**)	CQC has Less Rework than Non-CQC	D	D	A
B4o	Navy Overinspects CQC	D	D	D
B4p(**)	Respondent Prefers CQC to Non-CQC	D	D	A
B4q	CQC Reduces Costs	D	D	A
B4r	Contractor would Hire CQC Representative in QC Function if no CQC	D	D	A

Key: (N) - Navy
(C) - Contractor
(A) - Agree
(D) - Disagree
(*) - Contractor Integrity/Talent Statement
(**) - Key Statement

APPENDIX A

A. BACKGROUND

1. What is your present job title?

ROICC_____ AROICC_____ INSPECTOR/CONST REP._____

EFD AREA COORDINATOR_____ CONTRACT SPECIALIST_____

CQC REP. _____ CQC CONTRACTOR_____ OTHER_____

2. What is your rank (military/civilian) or company position?

_____

3. How many Contractor Quality Control (CQC) contracts have you inspected, administered, or been awarded in the past five years in the following ranges?

	#	EFD
Less than $1 million	_____	_____
$1 to $5 million	_____	_____
Greater than $5 million	_____	_____

4. How many non-CQC contracts have you inspected, administered, or been awarded in the past five years in the same ranges?

	#	EFD
Less than $1 million	_____	_____
$1 to $5 million	_____	_____
Greater than $5 million	_____	_____

5. In questions 4 and 5, note the Engineering Field Division (EFD) with which you coordinated on these same contracts.

B. ATTITUDES

1. In general, who should be responsible for the inspection of contract construction for compliance with plans and specifications?

Navy___ Designer___ Contractor___ Other___

2. In general, who should be responsible for the progress inspection of contract construction?

Navy___ Designer___ Contractor___ Other___

3. In general, who should be responsible for the final (acceptance) inspection of contract construction?

Navy___ Designer___ Contractor___ Other___

4. Check the column that best fits your attitude toward the following statements:

	Strongly disagree	Slightly disagree	No opinion	Slightly agree	Strongly agree
a. The contractor should be responsible for the quality of his work and would provide adequate self-inspection without the CQC contract provision.					
b. CQC usually provides the means for a smooth interface between the contractor and the Navy.					
c. CQC usually reduces the time necessary for submission of approved material cuts, progress payment requests, correspondence, etc.					
d. CQC provides adequate flexibility to the contractor to control his job progress and allows the contractor to recognize potential problems sooner than under non-CQC.					
e. CQC contracts experience more problems or delays than non-CQC.					
f. The finished product under CQC is better than under non-CQC.					
g. There is a conflict of interest inherent to CQC since the contractor inspects himself.					
h. CQC Reps. are usually sufficiently qualified to perform the specified CQC function.					

	Strongly disagree	Slightly disagree	No opinion	Slightly agree	Strongly agree
i. CQC contracts are better designed than non-CQC.					
j. Contractors usually allow the CQC Rep. free rein in performing his duties.					
k. A complete, usable CQC plan is vital to the proper performance of CQC.					
l. Navy personnel usually understand the requirements of the CQC program.					
m. The qualifications of the CQC Rep. should be specified in the contract.					
n. There is less disapproved work or re-work on a CQC contract than on a non-CQC.					
o. The Navy overinspects CQC contracts.					
p. I prefer CQC to non-CQC contracts.					
q. In general, costs are reduced under CQC.					
r. The contractor would hire the CQC individual in a similar function under non-CQC.					

C. COSTS

1. What is the approximate pay scale for a CQC Rep. assigned to a contract in the following ranges?

   Less than $1 million $_____/mo.

   $1 to $5 million $_____/mo.

   Greater than $5 million $_____/mo.

2. What is the approximate pay scale for a Navy inspector assigned to a contract in the following ranges?

   Less than $1 million $_____/mo.

   $1 to $5 million $_____/mo.

   Greater than $5 million $_____/mo.

3. What are the approximate costs of administering a CQC contract (transportation, testing, correspondence, report submission, etc.)?

   $_____/mo.

4. What are the approximate costs of administering a non-CQC contract (see #3 above)

   $_____/mo.

5. Does the IRS or other government agencies audit CQC contracts more frequently than non-CQC?

   Yes_____ No_____

6. How much would a typical contract bid price be reduced or increased if the CQC clause were eliminated?

   Reduced by $_____

   Increased by $_____

7. Please include here any comments or questions that you feel are essential to this research or that are missing from this survey:

APPENDIX B

A. THE WEIGHTING PROCESS

In order to provide data of most meaningful quality, all survey responses have been weighted. The weighting process was designed so that the answers made by an individual with limited or no experience in CQC would not be given the same credence as those from a more experienced individual. Weighting was accomplished in several steps. First, the number of non-CQC contracts listed by the respondent was multiplied by one, two, or three, depending on the dollar value of the contract, and the number of CQC contracts was multiplied by four, five, or six in the same manner. The numbers obtained were then added to determine a total score for each respondent. Government surveys having a total score from 0 to 100 were assigned a weight of one, surveys from 101 to 300 a weight of two, surveys from 301 to 700 a weight of three, and surveys with scores greater than 700 were weighted four. Contractor surveys were processed in the same manner except that scores from 0 to 50 were weighted one, 51 to 100 weighted two, and greater than 100 weighted three. The weights obtained for the responses of each respondent were used in the calculation of the response data shown in the figures in Chapter III.

B. SENSITIVITY ANALYSIS

The selection of the proper weighting process was very important to the outcome of the thesis. In cases where the recommendations of research are based on a great amount of data, a sensitivity analysis is recommended. Prior to the accomplishment of the sensitivity analysis, guidelines were selected under which the sensitivity of the data to changes in the values of the selected weights could be examined. These assumptions or guidelines were as follows:

1. Any weighting system selected should give a signifi cant emphasis to respondents with extensive CQC experience.

2. Any weighting system selected should give greater weight to contracts of greater value.

3. The system should provide a broad base of low-rated responses combined with a proportionately smaller grouping of higher-weighted responses.

4. The weighting system selected should be as uncomplicated as possible.

In order to verify the selection of the weighting process, a sensitivity analysis was performed for each of the steps. Prior to the selection of the multiplication factors, various combinations of factors were applied to a typical set of response data and the results observed. This process is shown in Table XXXIV. Trials four and five of Table XXXIV were eliminated since they gave too great an emphasis to CQC and non-CQC experience. Of the three remaining combinations,

TABLE XXXIV

WEIGHTING SENSITIVITY ANALYSIS

CQC Contracts Ranges	Number Contracts	Alternatives 1 Multi. Factor	1 Score	2 Multi. Factor	2 Score	3 Multi. Factor	3 Score	4 Multi. Factor	4 Score	5 Multi. Factor	5 Score
Less than $1 Million	1	2	2	2	2	4	4	1	1	3	3
$1 Million to $5 Million	10	4	40	4	40	5	50	3	30	6	60
Greater than $5 Million	5	6	30	6	30	6	30	5	25	9	45
Total/% Total	16/22%		72/53%		72/51%		84/57%		56/31%		108/63%
Non-CQC Contracts Ranges											
< $1 Million	50	1	50	1	50	1	50	2	100	1	50
$1 Million to $5 Million	5	2	10	3	15	2	10	4	20	2	10
> $5 Million	1	3	3	5	5	3	3	6	6	3	3
Total/% Total	56/78%		63/47%		70/49%		63/43%		126/69%		63/37%
Grand Total	72		135		142		147		182		171

number three was selected since it gave the greater emphasis to CQC experience (57%), while at the same time not minimizing the effect of non-CQC experience (43%), and at the same time was also the simplest of the processes to apply.

The selection of the weights themselves was next accomplished by varying the groupings of the weighted totals and observing the change in the percentage of responses in each new group. Table XXXV shows this process for Government responses. Alternative three was selected since it applies the greatest effect to the highest two groupings (14%) but does not at the same time minimize the effect of the two lowest groups (86%). In addition, alternative three provided the most uniform proportional difference between the groupings. Table XXXVI displays the contractor responses. In a similar manner, alternative two was selected as the best combination of weights to apply to these responses.

TABLE XXXV

NAVY RESPONSE RANGE GROUPING

Response Range	Response Source								Alternatives			
	NAVFAC	CHESDIV	NORTHDIV	LANTDIV	SOUTHDIV	WESTDIV		%	1	2	3	4
	No. Resp.	No. Resp.	No. Resp.	No. Resp.	No. Resp.	No. Resp.	Total	Resp.	%	%	%	%
0-100		4	17	27	14	22	84	53	71	53	53	71
101-200		4	3	7	8	7	29	18			33	
201-300		2	7	7	3	3	24	15	22	40		
301-400			4	3	1	3	11	7				
401-500					1		1	.5				26
501-600			1		2		3	2	4	4	11	
601-700					1		1	.5				
701-800					2		2	1				
801-900											3	3
901-1000									3	3		
Greater than 1000	1	1		1	2		5	3				
Total	1	11	32	45	34	37	160					

TABLE XXXVI

CONTRACTOR RESPONSE RANGE GROUPING

Response Range	Response Source								Alternatives			
	CHESDIV		NORTHDIV		LANTDIV		SOUTHDIV		WESTDIV							
	No.	Resp.	No.	Resp.	No.	Resp.	No.	Resp.	No.	Resp.	Total	% Resp.	1 %	2 %	3 %	4 %
0-50	4		6		3		3		9		25	70	84	70	84	70
51-75	1		0		2		2		0		5	14		22		
76-100	0		0		0		0		3		3	8	16		8	30
Greater than 100	0		1		1		0		1		3	8		8	8	
Total	5		7		6		5		13		36					

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